THE NATIONAL GEOGRAPHIC MAGAZINE

Vol. XIV FEBRUARY, 1903 No. 2

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Published for the National Geographic Society
By McClure, Phillips & Co., of New York

$2.50 a Year REPRINT 25 Cents a Number

Entered at the Post-office in Washington, D. C., as Second-class Mail Matter.

THE NATIONAL GEOGRAPHIC MAGAZINE

AN ILLUSTRATED MONTHLY, published for the National Geographic Society, of Washington, D. C., by McClure, Phillips & Co. All communications should be addressed to the Managing Editor of the National Geographic Magazine, Corcoran Building, Washington, D. C. Business communications may also be addressed to McClure, Phillips & Co., at 141 East 25th St., New York City.

25 CENTS A NUMBER; $2.50 A YEAR

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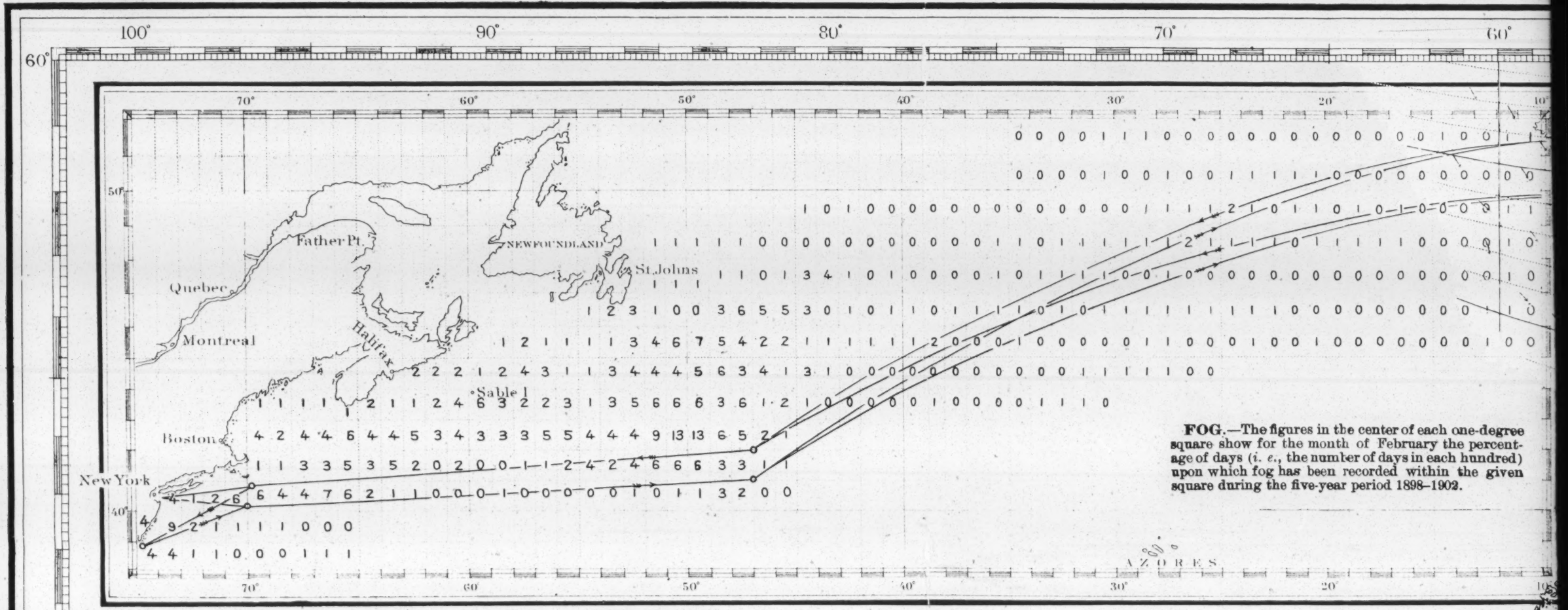
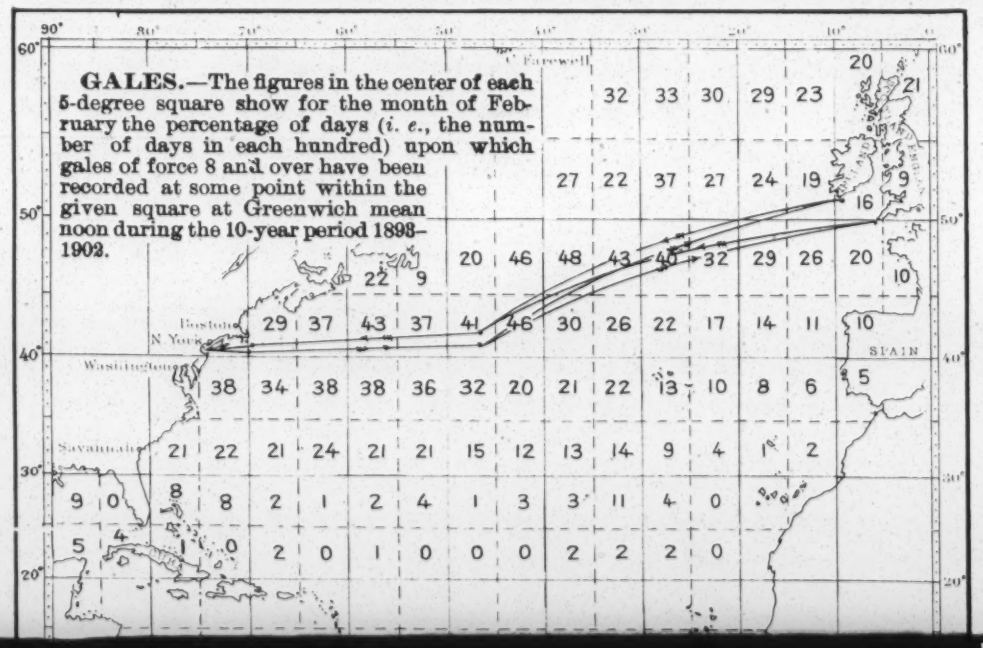


FOG.—The figures in the center of each one-degree square show for the month of February the percentage of days (*i. e.*, the number of days in each hundred) upon which fog has been recorded within the given square during the five-year period 1898–1902.



GALES.—The figures in the center of each 5-degree square show for the month of February the percentage of days (*i. e.*, the number of days in each hundred) upon which gales of force 8 and over have been recorded at some point within the given square at Greenwich mean noon during the 10-year period 1893–1902.

TRACKS OF CYCLONIC STORMS IN FEBRUARY.

I. February 2–10, 1897.
II. February 16–18, 1897.
III. February 9–11, 1897.
IV. February 19–28, 1898.
V. February 1– 5, 1899.
VI. February 13–15, 1899.
VII. February 16–20, 1899.
VIII. February 7–10, 1900.
IX. February 5– 7, 1900.
X. February 5– 7, 1900.
XI. February 17–20, 1900.

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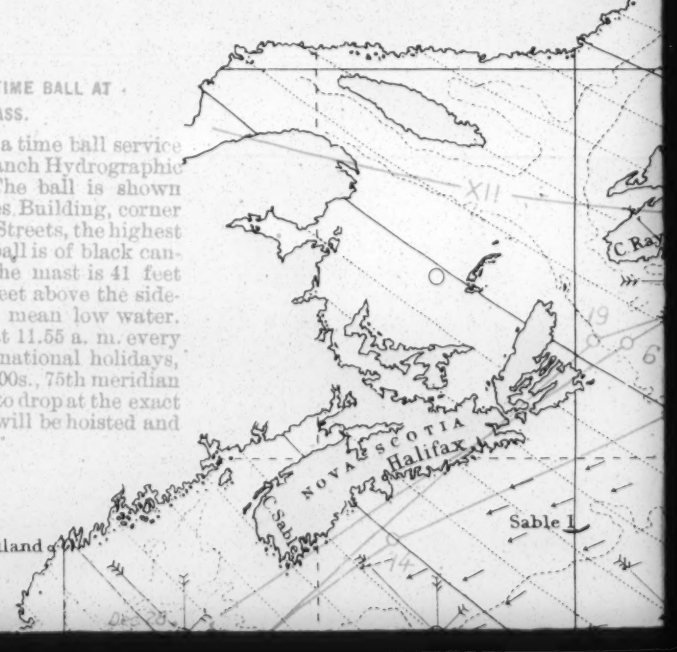

XUM

PILOT CHART OF THE NORTH ATLANTIC O

REPRINT

70° 60° 50° 40°

30° 20° 10°

50°

40°

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AZORES

30° 20°

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Fastnet

C. Farewell

VAR. 14.5° W.

VAR. 40° W.

NEWFOUNDLAND

C. Ray

St. Pierre

C. Race

Virgin Rks

Flemish Cap

NOVA SCOTIA

Halifax

Sable I.

C. Sable

Portland

STEAMSHIP ROUTES

THE PRINCIPAL TRANSATLANTIC STEAMSHIP COMPANIES HAVE ADOPTED THESE ROUTES AND THEY ARE NOW ACTUALLY IN USE. SAILING VESSELS SHOULD AVOID THEM AS FAR AS PRACTICABLE.

XUM

ORTH ATLANTIC OCEAN

PRINT

Date of Publication, January 31

40° 30° 20° 10° 0°

Farewell

VAR. 45° W.

VAR. 40° W.

VAR. 35° W.

VAR. 30° W.

VAR. 25° W.

VAR. 20° W.

59°00'N 14°00'W

58°40'N 14°00'W

Rockall

Pentland Firth

SCOTLAND

Glasgow

Moville

100 fathom curve

IRELAND

Dublin

Liverpool

ENGLAND

Queenstown

Cardiff

London

Fastnet

51°20'N 9°36'W

Scilly Is

49°52'N 6°27'W

Brest

FRAN

STEAMSHIP ROUTES

THE PRINCIPAL TRANSATLANTIC STEAMSHIP COMPANIES ARE ACCUSTOMED TO THESE ROUTES AND THEY ARE NOW ACTUALLY IN USE. SAILING VESSELS SHOULD AVOID THEM AS MUCH AS POSSIBLE.

EQUATOR

CHANNEL TO GULF OF MEXICO — LOW POWERED STEAMERS

ROUTE TO EQUATOR

C. Finisterre

Santander

Bilbao

EQUATOR CROSSINGS FOR SA

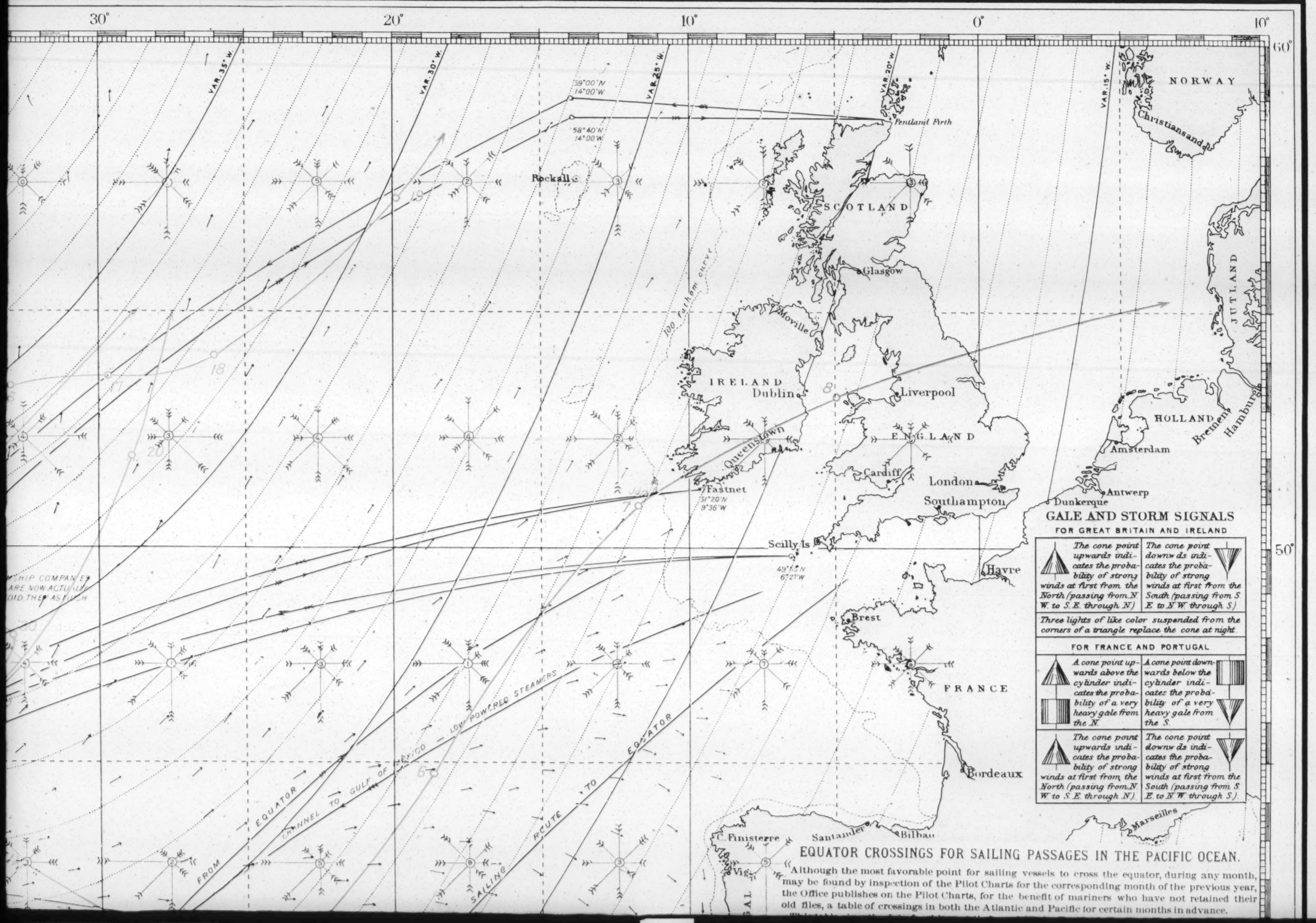
Feb. 5

XUM

C OCEAN

Date of Publication, January 31

FEBRUARY 1903.



EQUATOR CROSSINGS FOR SAILING PASSAGES IN THE PACIFIC OCEAN.

Although the most favorable point for sailing vessels to cross the equator, during any month, may be found by inspection of the Pilot Charts for the corresponding month of the previous year, the Office publishes on the Pilot Charts, for the benefit of mariners who have not retained their old files, a table of crossings in both the Atlantic and Pacific for certain months in advance.

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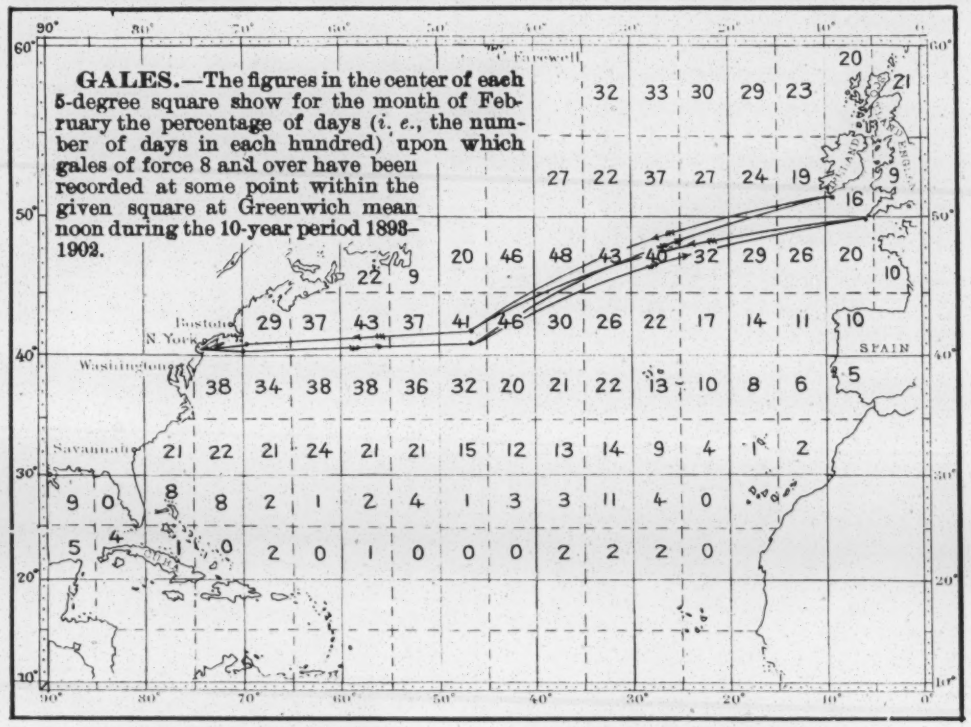
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Farewell
Boston
N. York
Washington
Savannah
SPAIN
32 33 30 29 23 20 21
27 22 37 27 24 19 9 16
22 9 20 46 48 43 40 32 29 26 20 10
29 37 43 37 41 46 30 26 22 17 14 11 10
38 34 38 38 36 32 20 21 22 13 10 8 6 5
21 22 21 24 21 21 15 12 13 14 9 4 1 2
9 0 8 8 2 1 2 4 1 3 3 11 4 0
5 4 1 0 2 0 1 0 0 0 2 2 2 0

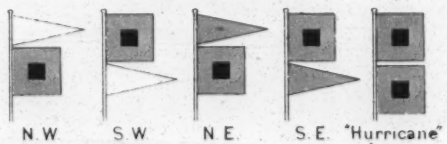
RECOMMENDED ROUTES FOR FULL AND LOW POWERED STEAMSHIPS.

Attention is called to the west-bound steamship route along the parallel of 38° N. An examination of the latest information in its possession leads the U. S. Hydrographic Office to recommend this route for the winter season for vessels of 11 knots and under. It is believed that low powered steamers will thereby keep out of the region of adverse winds and currents and gain considerable time.

Attention is also called to the routes recommended for full and low powered steamships to and from northern Europe and the Gulf of Mexico. An examination of the winds and currents along the routes here shown leads the U. S. Hydrographic Office to recommend them to steamships of the classes indicated.

Shipmasters are cordially invited to give their experience with these routes.

STORM SIGNALS



Flags 8 feet square. Pennants 5 feet hoist, 12 feet fly

EXPLANATION.

Storm signals are displayed by the U. S. Weather Bureau at 141 stations situated on the Atlantic and Gulf coasts of the United States from Eastport, Maine, to Brownsville, Texas. The stations at Cape Henry and Jupiter are equipped for signaling by the International Code, and are prepared to transmit by telegraph the messages of passing vessels.

Storm Warning Flags.—A red flag, with a black center, indicates that a storm of marked violence is expected.

The pennants displayed with the flags indicate the direction of the wind: red, easterly (from northeast to south); white, westerly (from southwest to north). The pennant above the flag indicates that the wind is expected to blow from the northerly quadrants; below, from southerly quadrants.

By night a red light indicates easterly winds, and a white light above a red light, westerly winds.

Hurricane Warnings.—Two red flags, with black centers, displayed one above the other, indicate the expected approach of tropical hurricanes, and also of those extremely severe and dangerous storms which occasionally move across the lakes and northern Atlantic coast.

Hurricane warnings are not displayed at night.

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XI. February 17–20, 1900.
XII. January 27–February 8, 1902.
XIII. February 11–19, 1902.

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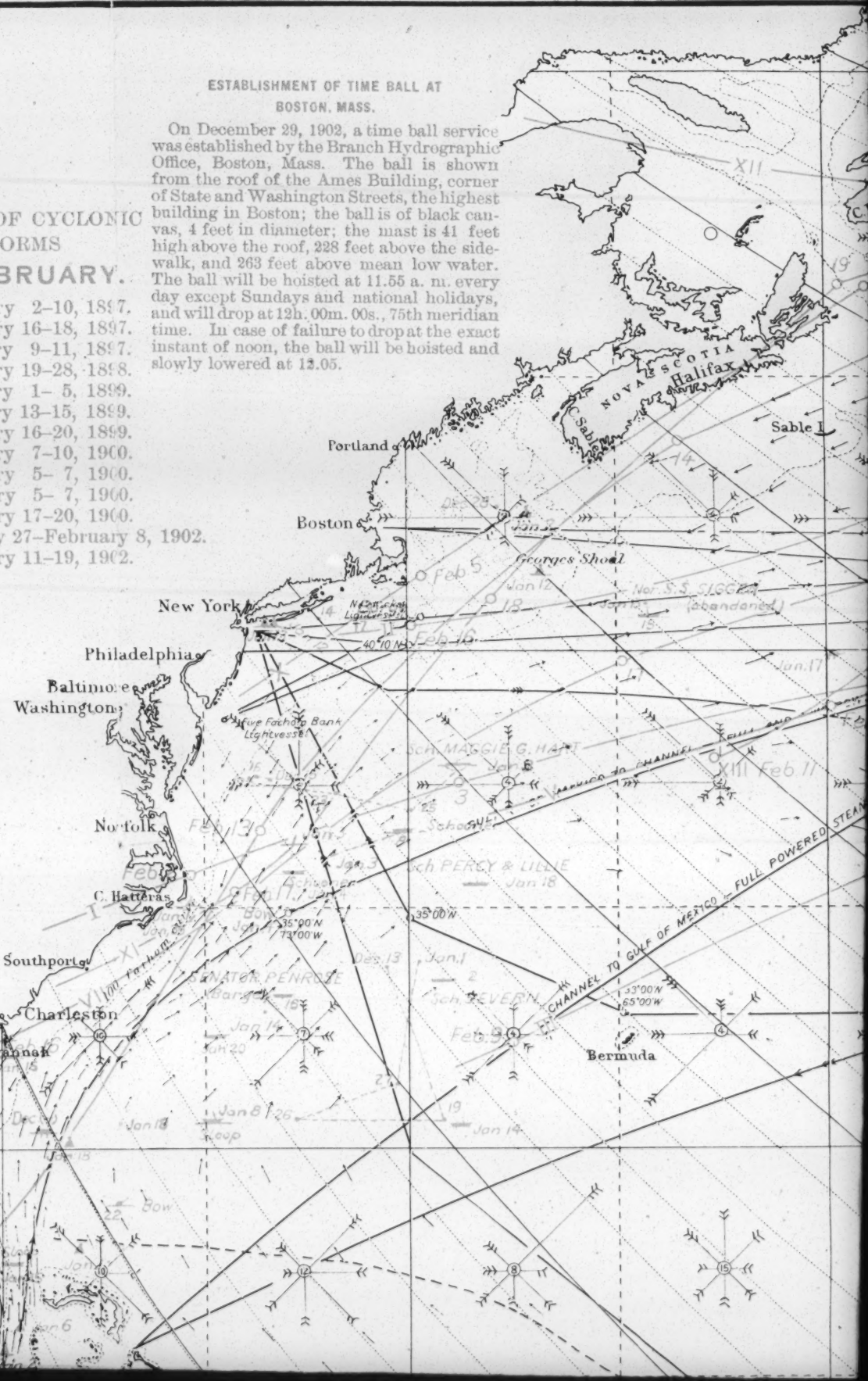

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1902.

NEWFOUNDLAND
C. Ray
St. Pierre
C. Race
Virgin Rks
Flemish Cap
NOVA SCOTIA
Halifax
C. Sable
Sable I.
Portland
Boston
New York
Georges Shoal
Five Fathom Bank Lightvessel
Bermuda

STEAMSHIP ROUTES

THE PRINCIPAL TRANSATLANTIC STEAMSHIP COMPANIES HAVE ADOPTED THESE ROUTES AND THEY ARE NOW ACTUALLY IN USE. SAILING VESSELS SHOULD AVOID THEM AS MUCH AS POSSIBLE.

CHANNEL TO GULF OF MEXICO — FULL POWERED STEAMERS

CHANNEL TO GULF OF MEXICO — SAILING ROUTE — LOW POWERED STEAMERS

WESTBOUND ROUTE FOR LOW POWERED STEAMERS TO EQUATOR

35°00'N 73°00'W

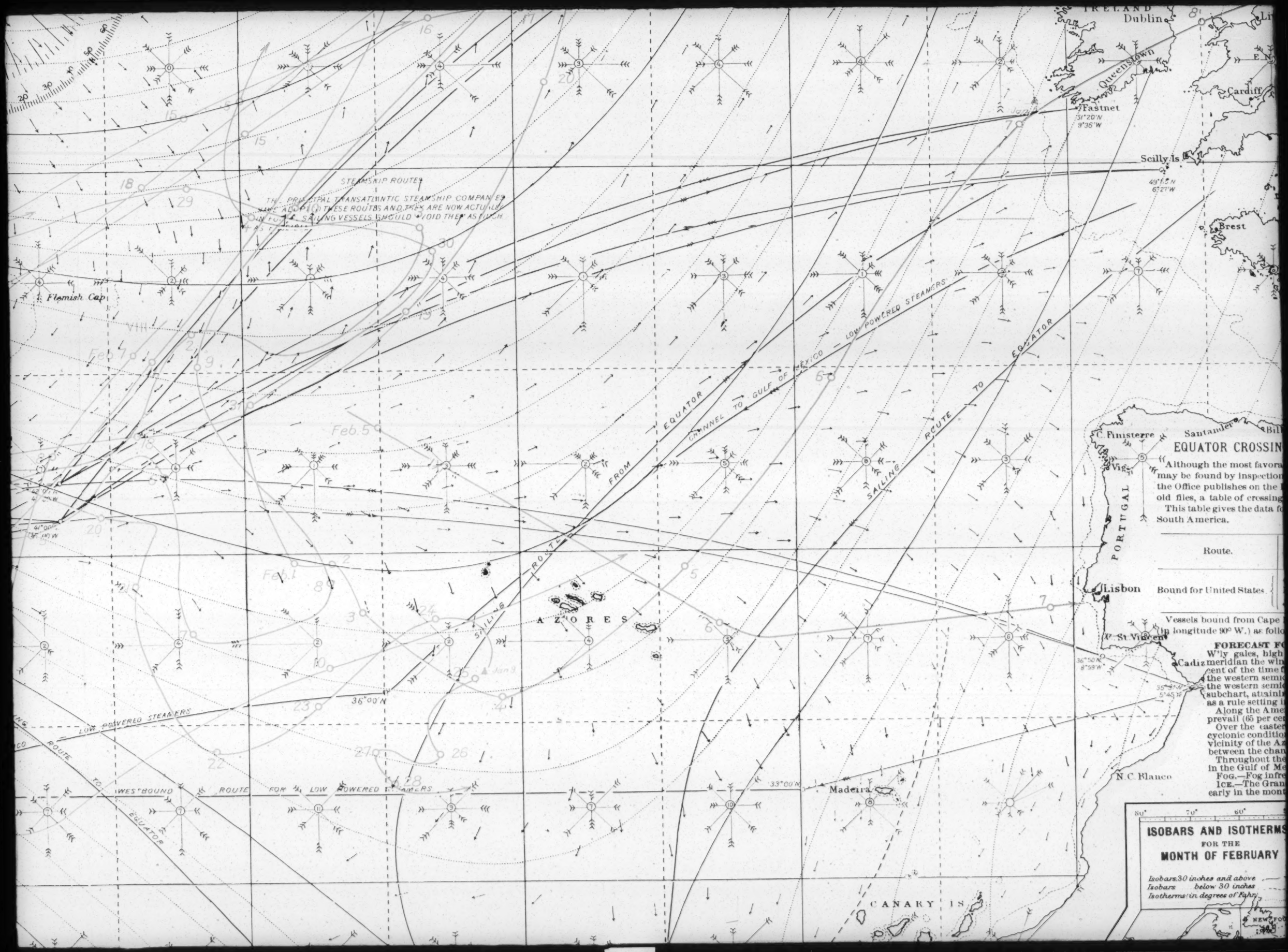
33°00'N 65°00'W

36°00'N

40°10'N

41°00'N 57°40'W

XUM



IRELAND
Dublin
Queenstown
Cardiff
Fastnet
51°20'N
9°36'W
Scilly Is
49°55'N
6°27'W
Brest
STEAMSHIP ROUTES
THE PRINCIPAL TRANSATLANTIC STEAMSHIP COMPANIES HAVE ADOPTED THESE ROUTES AND THEY ARE NOW ACTUALLY IN FOCUS. SAILING VESSELS SHOULD AVOID THEM AS MUCH AS FEASIBLE
Flemish Cap
Feb. 7
Feb. 5
Feb. 1
Jan. 9
Jan. 8
FROM EQUATOR
CHANNEL TO GULF OF MEXICO — LOW POWERED STEAMERS
SAILING ROUTE TO EQUATOR
SAILING ROUTE
AZORES
36°00'N
33°00'N
LOW POWERED STEAMERS
ROUTE TO EQUATOR
WESTBOUND ROUTE FOR LOW POWERED STEAMERS
Madeira
CANARY IS
C. Finisterre
Santander
Vigo
PORTUGAL
Lisbon
C. St. Vincent
Cadiz
N.C. Blanco
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FOR THE
MONTH OF FEBRUARY
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Isobars below 30 inches
Isotherms (in degrees of Fahr.)
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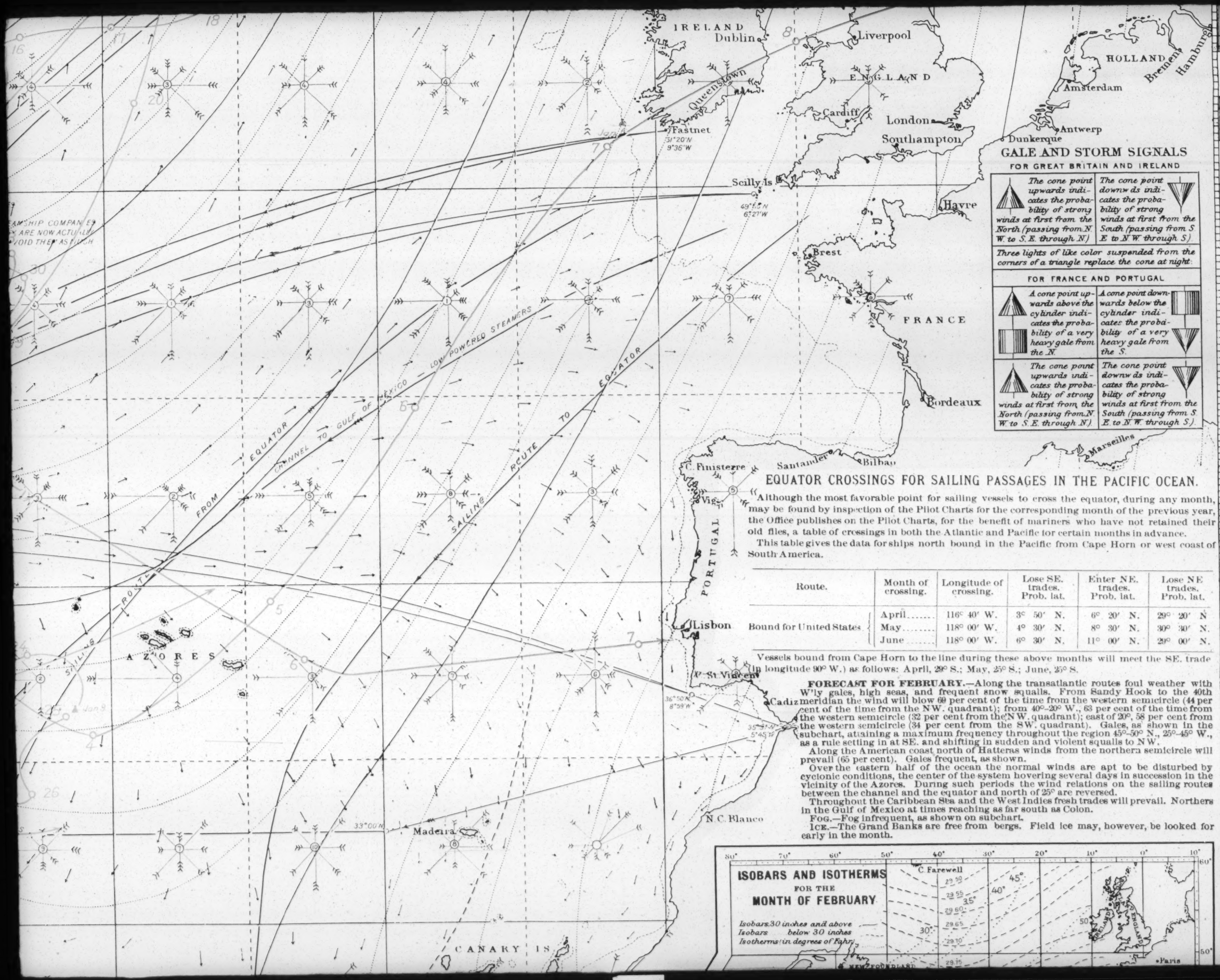

GALE AND STORM SIGNALS

FOR GREAT BRITAIN AND IRELAND

The cone point upwards indicates the probability of strong winds at first from the North (passing from N. W. to S. E. through N.)	*The cone point downwards indicates the probability of strong winds at first from the South (passing from S. E. to N. W. through S.)*

Three lights of like color suspended from the corners of a triangle replace the cone at night.

FOR FRANCE AND PORTUGAL

A cone point upwards above the cylinder indicates the probability of a very heavy gale from the N.	*A cone point downwards below the cylinder indicates the probability of a very heavy gale from the S.*
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This table gives the data for ships north bound in the Pacific from Cape Horn or west coast of South America.

Route.	Month of crossing.	Longitude of crossing.	Lose SE. trades. Prob. lat.	Enter NE. trades. Prob. lat.	Lose NE trades. Prob. lat.
Bound for United States	April	116° 40′ W.	3° 50′ N.	6° 20′ N.	29° 20′ N
	May	118° 00′ W.	4° 30′ N.	8° 30′ N.	30° 30′ N.
	June	118° 00′ W.	6° 30′ N.	11° 00′ N.	29° 00′ N.

Vessels bound from Cape Horn to the line during these above months will meet the SE. trade (in longitude 90° W.) as follows: April, 29° S.; May, 25° S.; June, 25° S.

FORECAST FOR FEBRUARY.—Along the transatlantic routes foul weather with W'ly gales, high seas, and frequent snow squalls. From Sandy Hook to the 40th meridian the wind will blow 69 per cent of the time from the western semicircle (44 per cent of the time from the NW. quadrant); from 40°–20° W., 63 per cent of the time from the western semicircle (32 per cent from the NW. quadrant); east of 20°, 58 per cent from the western semicircle (34 per cent from the SW. quadrant). Gales, as shown in the subchart, attaining a maximum frequency throughout the region 45°–50° N., 25°–45° W., as a rule setting in at SE. and shifting in sudden and violent squalls to NW.

Along the American coast north of Hatteras winds from the northern semicircle will prevail (65 per cent). Gales frequent, as shown.

Over the eastern half of the ocean the normal winds are apt to be disturbed by cyclonic conditions, the center of the system hovering several days in succession in the vicinity of the Azores. During such periods the wind relations on the sailing routes between the channel and the equator and north of 25° are reversed.

Throughout the Caribbean Sea and the West Indies fresh trades will prevail. Northers in the Gulf of Mexico at times reaching as far south as Colon.

FOG.—Fog infrequent, as shown on subchart.

ICE.—The Grand Banks are free from bergs. Field ice may, however, be looked for early in the month.

Flags 8 feet square. Pennants 5 feet hoist, 12 feet fly

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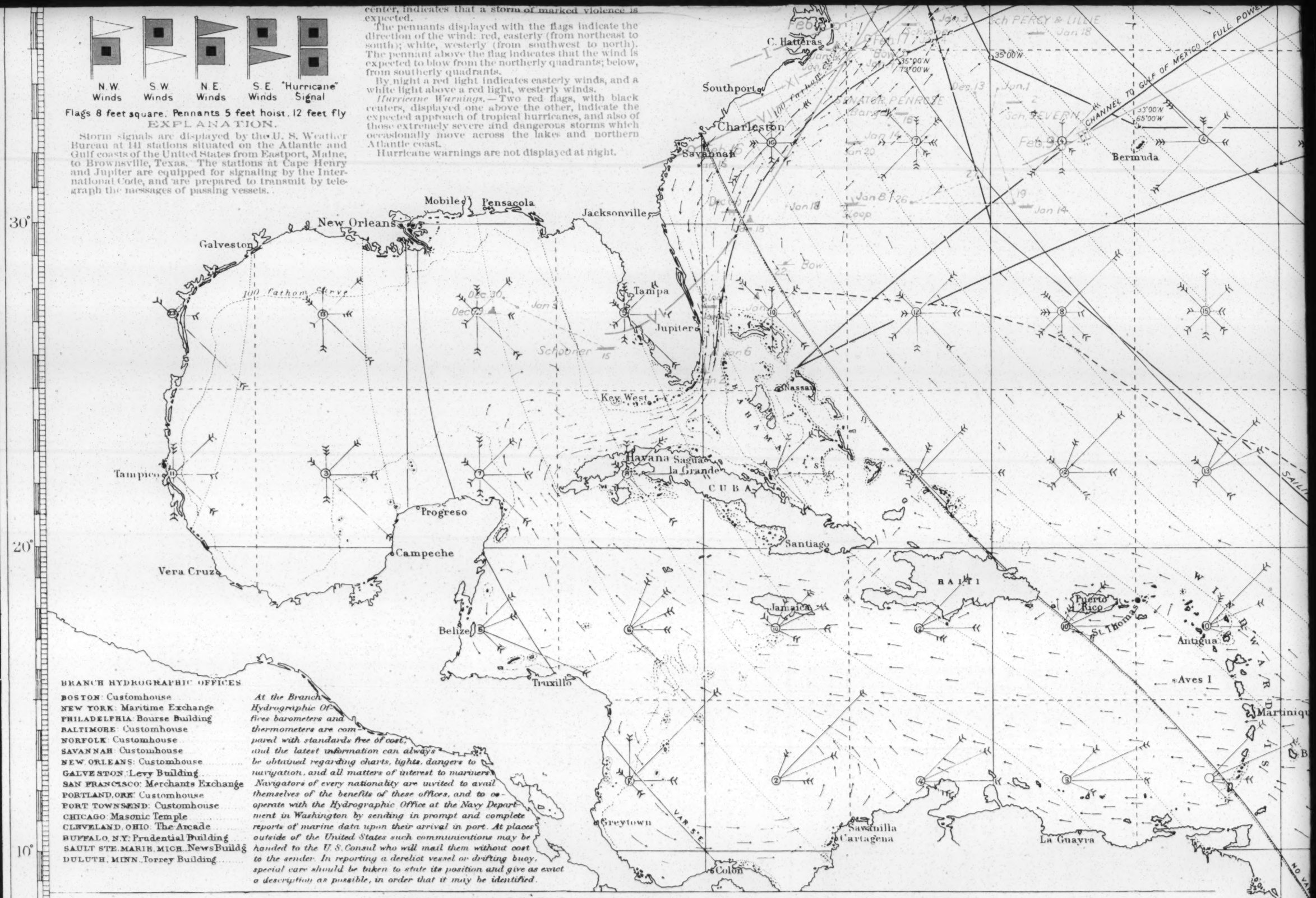


EXPLANATION OF THE SIGNIFICANCE OF THE COLORS AND SYMBOLS

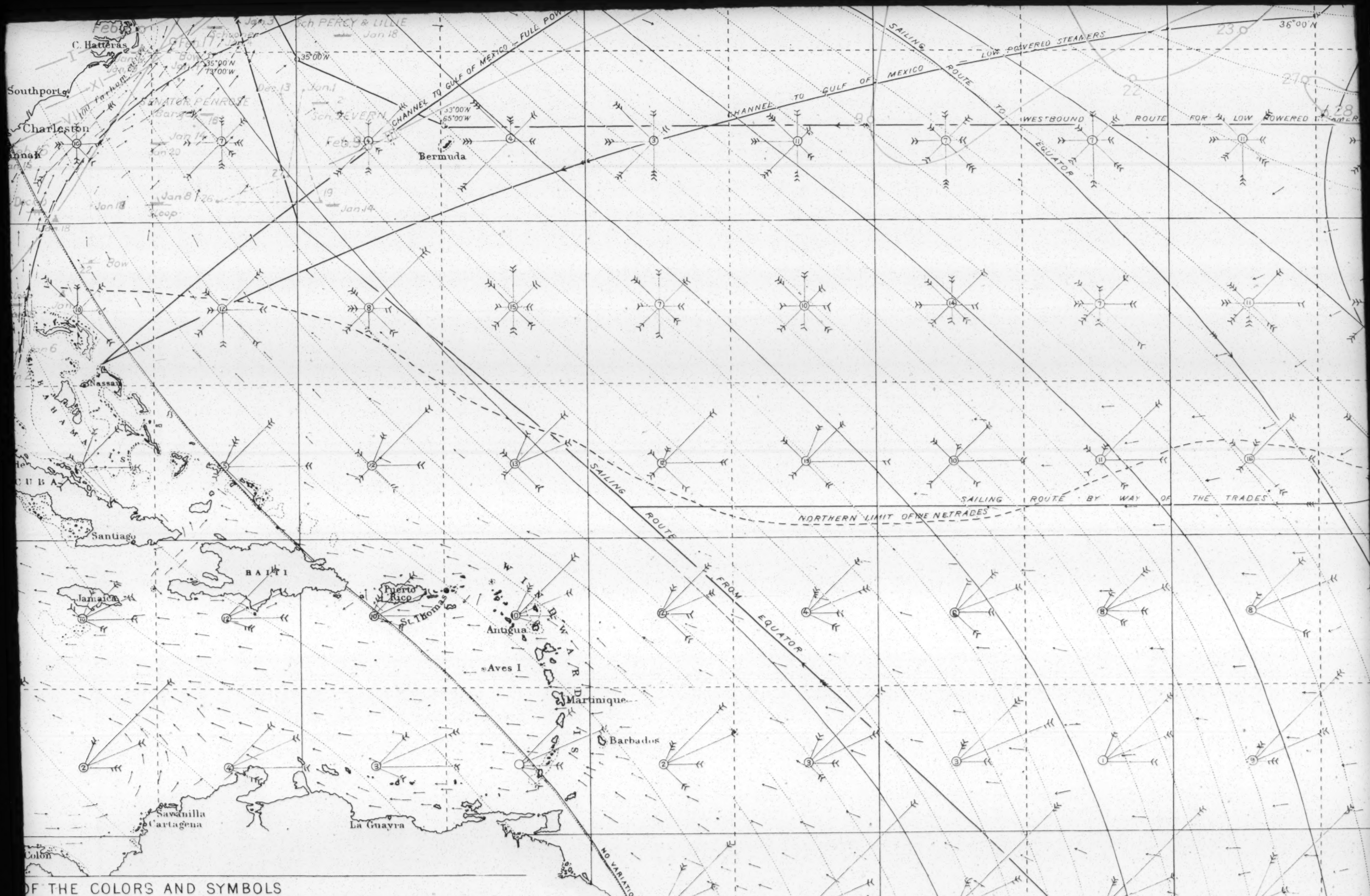
STORM TRACKS.—The several red lines indicate the path followed by the center of each of the more severe cyclonic storms that have occurred during the month of February in previous years. The successive positions of the storm center at Greenwich mean noon are indicated by small circles with dates set opposite to them.

The information in BLUE gives a general meteorological forecast, with deductions therefrom, for the month of February.

The tracks of some of the more important storms that have occurred during February in previous years are shown in RED.

MAGNETIC VARIATION The lines of equal

PREVAILING WINDS AND CALMS.—The wind rose in each 5-degree square shows the character of the winds that may be expected within that square during the current month. The arrows fly with the wind. The length of the arrow, measured (from the center of the circle) on the attached scale, gives the percentage of time (number of hours in each one hundred) that the wind may be expected to blow from the given point. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms, light airs and variable winds.



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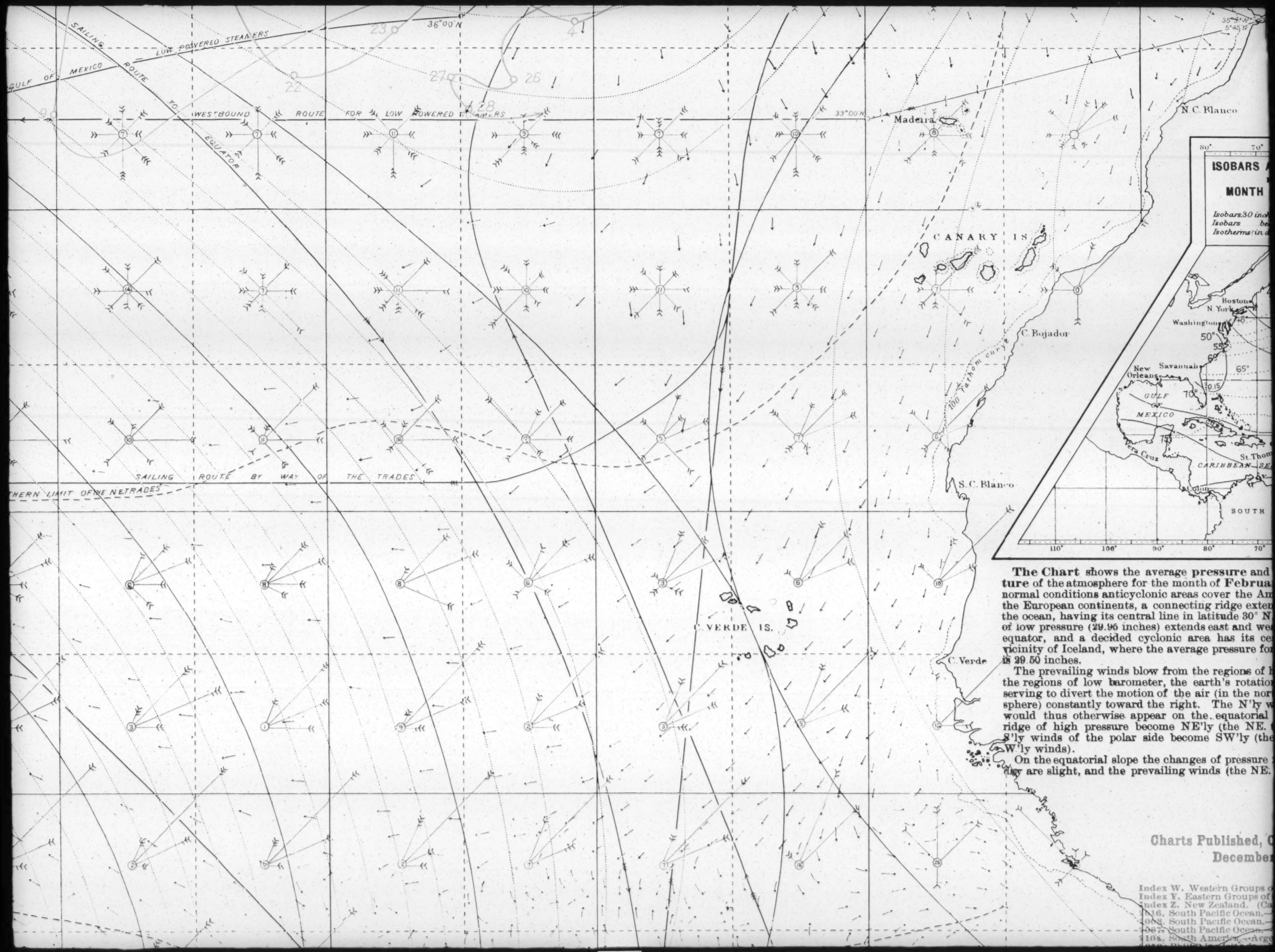
FOR EXAMPLE, the attached wind rose should



The Chart shows the average **pressure** and
ture of the atmosphere for the month of **Februa**
normal conditions anticyclonic areas cover the Am
the European continents, a connecting ridge exten
the ocean, having its central line in latitude 30° N
of low pressure (29.95 inches) extends east and we
equator, and a decided cyclonic area has its ce
vicinity of Iceland, where the average pressure fo
is 29.50 inches.

The prevailing winds blow from the regions of h
the regions of low barometer, the earth's rotatio
serving to divert the motion of the air (in the nor
sphere) constantly toward the right. The N'ly w
would thus otherwise appear on the equatorial
ridge of high pressure become NE'ly (the NE.
S'ly winds of the polar side become SW'ly (the
W'ly winds).

On the equatorial slope the changes of pressure
day are slight, and the prevailing winds (the NE.

Charts Published, C
December

Index W. Western Groups o
Index Y. Eastern Groups of
Index Z. New Zealand. (Ca
2016. South Pacific Ocean.—
2008. South Pacific Ocean.—
2067. South Pacific Ocean.—
2104. South America.—Arge

XUM

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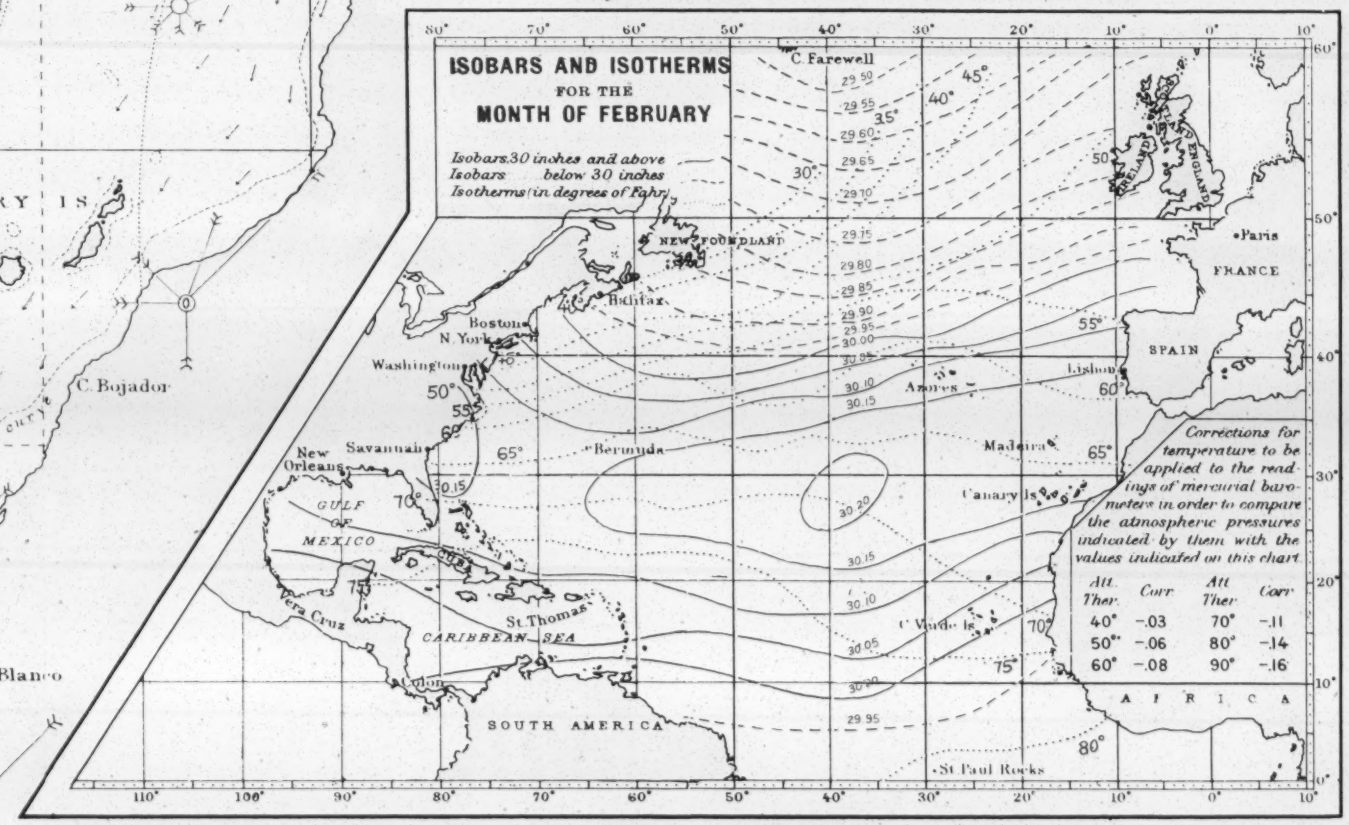

The Chart shows the average **pressure** and **temperature** of the atmosphere for the month of **February**.—Under normal conditions anticyclonic areas cover the American and the European continents, a connecting ridge extending across the ocean, having its central line in latitude 30° N. A trough of low pressure (29.95 inches) extends east and west along the equator, and a decided cyclonic area has its center in the vicinity of Iceland, where the average pressure for the month is 29.50 inches.

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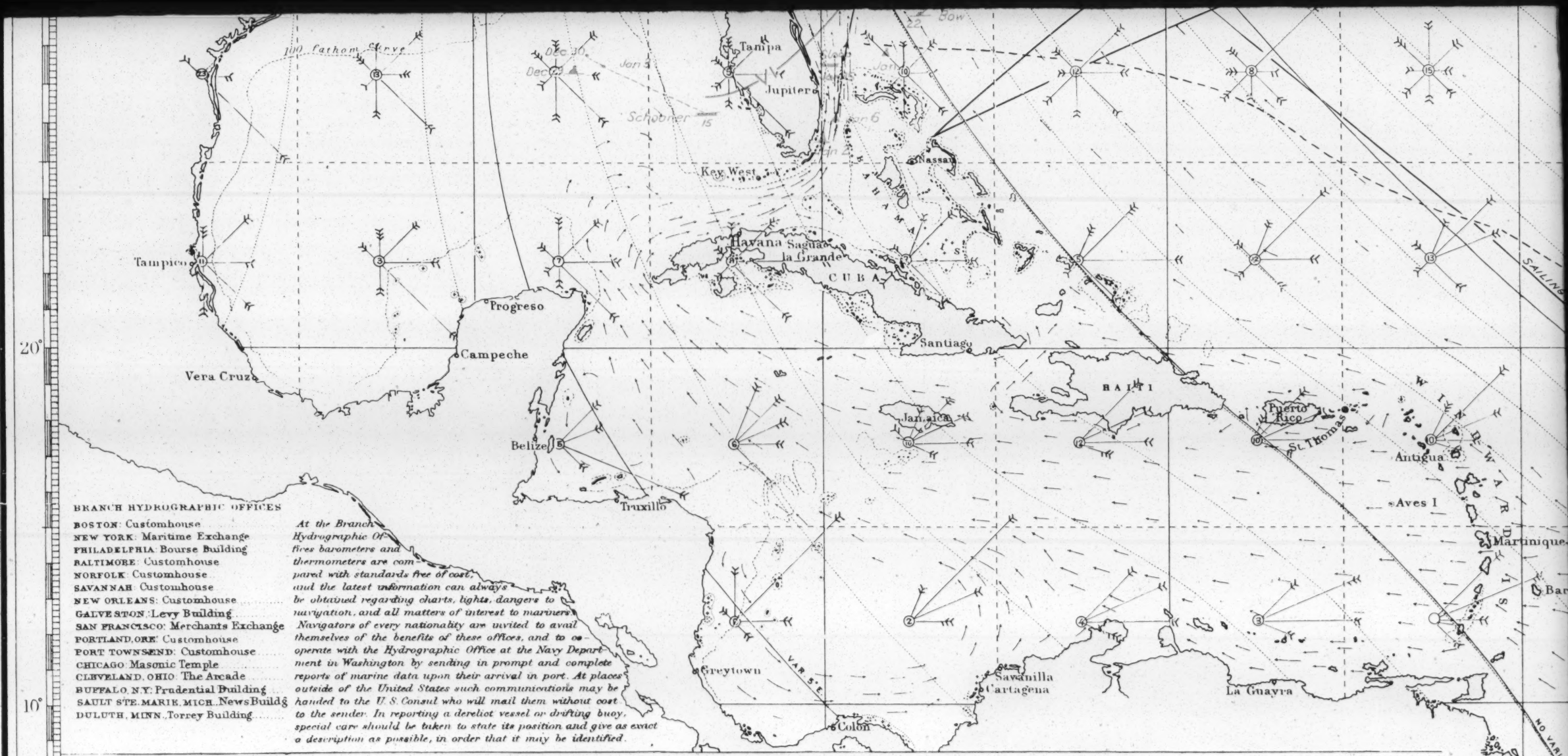


BRANCH HYDROGRAPHIC OFFICES

BOSTON: Customhouse
NEW YORK: Maritime Exchange
PHILADELPHIA: Bourse Building
BALTIMORE: Customhouse
NORFOLK: Customhouse
SAVANNAH: Customhouse
NEW ORLEANS: Customhouse
GALVESTON: Levy Building
SAN FRANCISCO: Merchants Exchange
PORTLAND, ORE: Customhouse
PORT TOWNSEND: Customhouse
CHICAGO: Masonic Temple
CLEVELAND, OHIO: The Arcade
BUFFALO, N.Y.: Prudential Building
SAULT STE. MARIE, MICH.: News Buildg
DULUTH, MINN.: Torrey Building

At the Branch Hydrographic Offices barometers and thermometers are compared with standards free of cost, and the latest information can always be obtained regarding charts, lights, dangers to navigation, and all matters of interest to mariners. Navigators of every nationality are invited to avail themselves of the benefits of these offices, and to cooperate with the Hydrographic Office at the Navy Department in Washington by sending in prompt and complete reports of marine data upon their arrival in port. At places outside of the United States such communications may be handed to the U. S. Consul who will mail them without cost to the sender. In reporting a derelict vessel or drifting buoy, special care should be taken to state its position and give as exact a description as possible, in order that it may be identified.

EXPLANATION OF THE SIGNIFICANCE OF THE COLORS AND SYMBOLS

STORM TRACKS.—The several red lines indicate the path followed by the center of each of the more severe cyclonic storms that have occurred during the month of February in previous years. The successive positions of the storm center at Greenwich mean noon are indicated by small circles with dates set opposite to them.

DERELICTS AND WRECKS _ The name of the vessel is given, unless it has not been ascertained: and the symbol represents, as far as possible, her rig and the condition in which she appeared at the date set opposite to her position. The successive positions in which she has been seen at the dates indicated are joined by lines of dashes.

ICEBERGS AND FIELD ICE _ The shaded symbols represent reports received after the 20th ult. Each report of ice seen along a given track is represented by a straight line joining the symbols placed at the first and last positions at which ice was seen and having the observed number of bergs written upon it. The numbers opposite the symbols at the ends of the line are the dates referred to by the report.

DRIFTING BUOYS WATERSPOUT REGION OF FREQUENT FOG

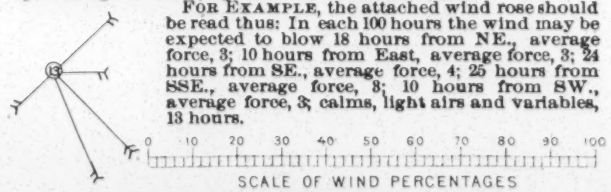
The information in BLUE gives a general meteorological forecast, with deductions therefrom, for the month of February.

The tracks of some of the more important storms that have occurred during February in previous years are shown in RED.

MAGNETIC VARIATION The lines of equal magnetic variation for every degree for the current year are shown by lines of fine dots.

OCEAN CURRENTS _ The yearly average set of the stream and drift currents is shown by the small black arrows.

PREVAILING WINDS AND CALMS.—The wind rose in each 5-degree square shows the character of the winds that may be expected within that square during the current month. The arrows fly with the wind. The length of the arrow, measured (from the center of the circle) on the attached scale, gives the percentage of time (number of hours in each one hundred) that the wind may be expected to blow from the given point. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms, light airs and variable winds.



FOR EXAMPLE, the attached wind rose should be read thus: In each 100 hours the wind may be expected to blow 18 hours from NE., average force, 3; 10 hours from East, average force, 3; 24 hours from SE., average force, 4; 25 hours from SSE., average force, 3; 10 hours from SW., average force, 3; calms, light airs and variables, 13 hours.

REGION OF EQUATORIAL RAINS

Edited by James Page

SAILING ROUTE FROM EQUATOR

SAILING ROUTE BY WAY OF THE TRADES

NORTHERN LIMIT OF THE NE TRADES

HAITI

Puerto Rico

St. Thomas

Antigua

Aves I

WINDWARD ISLANDS

Martinique

St. Lucia

Barbados

Savanilla

Cartagena

La Guayra

NO VARIATION

George Town

Cayenne

Amazon R.

VAR. 15° W

SOUTHERN LIMIT OF THE NE TRADES

NORTHERN LIMIT OF THE SE. TRADES

OLORS AND SYMBOLS

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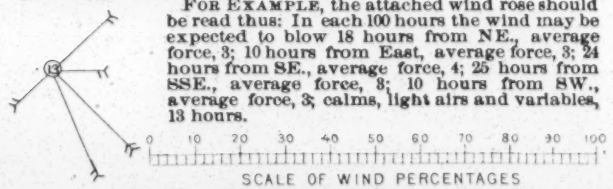
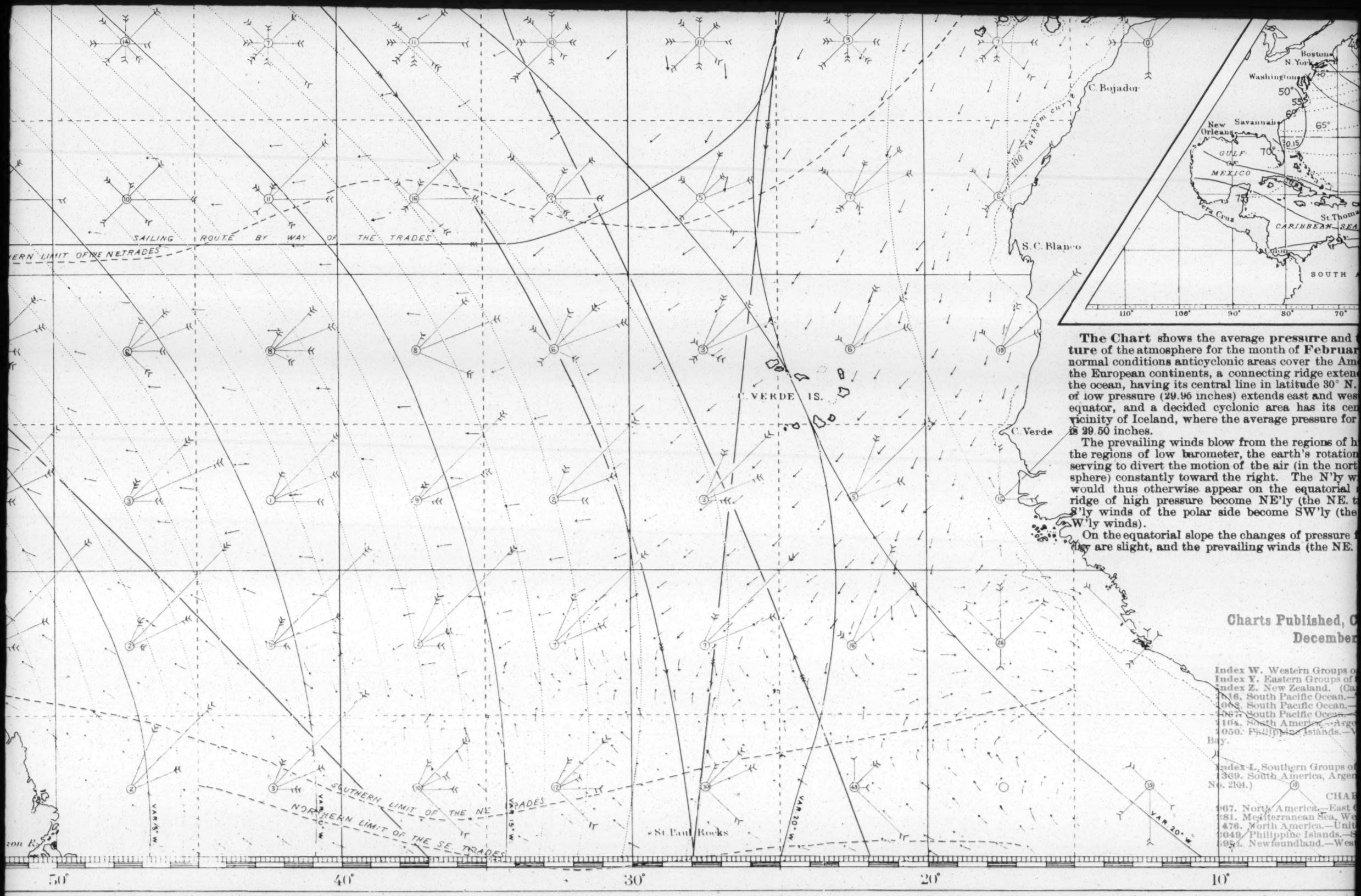


REGION OF EQUATORIAL RAINS

70° 60° 50° 40°

PUBLISHED MONTHLY AT THE HYDROGRAPHIC OFFICE,
Bureau of Equipment, Department of the Navy Washington, D.C.,
W.H.H. Southerland, Commander, U.S.N. Hydrographer



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381. Mediterranean Sea, We
1476. North America.—Unit
2049. Philippine Islands.—S
5951. Newfoundland.—West

PUBLISHED MONTHLY AT THE HYDROGRAPHIC OFFICE,
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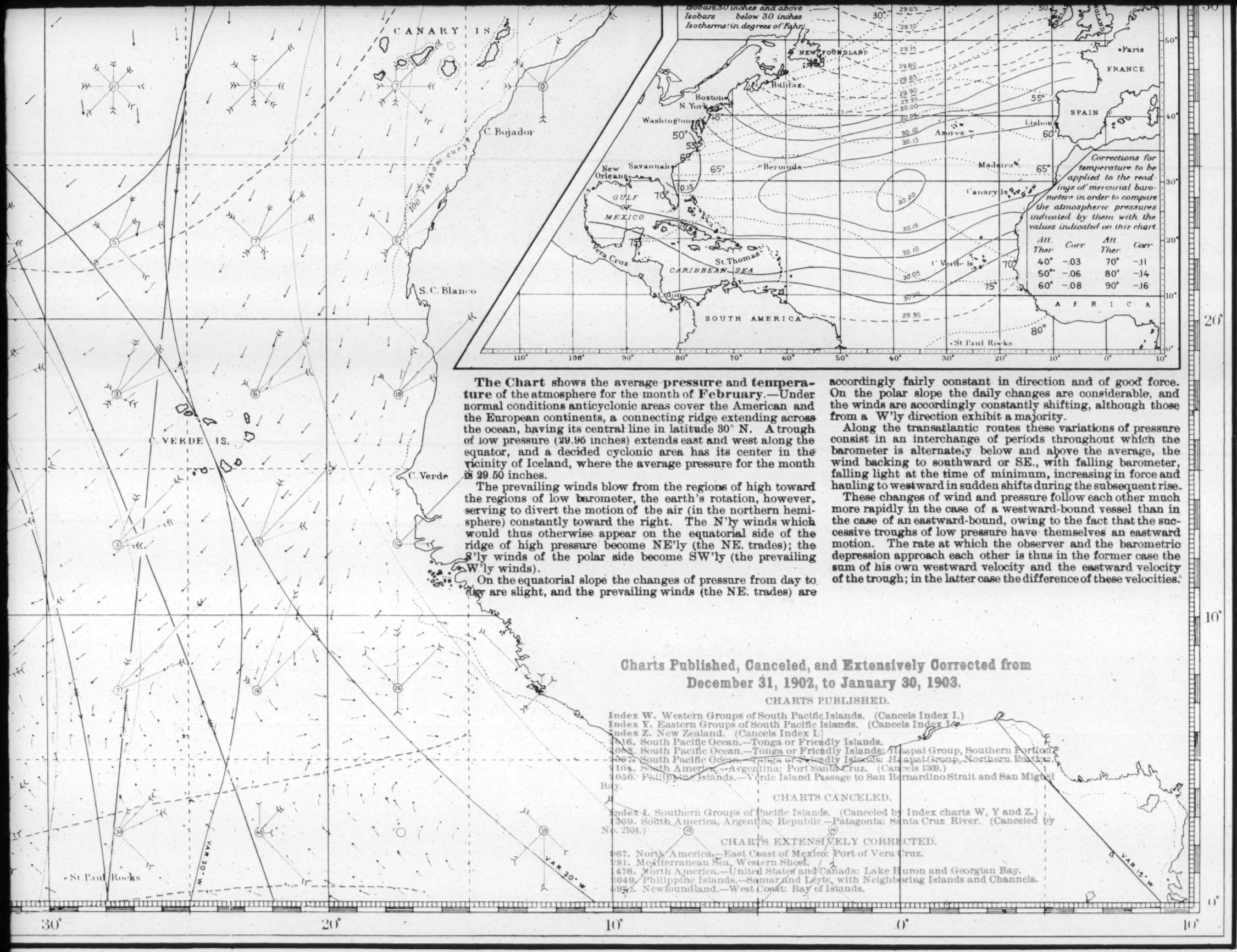
XUM



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2108. South America.—Argentina: Port Santa Cruz. (Cancels 1369.)
4050. Philippine Islands.—Verde Island Passage to San Bernardino Strait and San Miguel Bay.

CHARTS CANCELED.

Index I. Southern Groups of Pacific Islands. (Canceled by Index charts W, Y and Z.)
1369. South America, Argentine Republic.—Patagonia: Santa Cruz River. (Canceled by No. 2104.)

CHARTS EXTENSIVELY CORRECTED.

967. North America.—East Coast of Mexico: Port of Vera Cruz.
981. Mediterranean Sea, Western Sheet.
1476. North America.—United States and Canada: Lake Huron and Georgian Bay.
4049. Philippine Islands.—Samar and Leyte, with Neighboring Islands and Channels.
6952. Newfoundland.—West Coast: Bay of Islands.

Gr. Doerzel, Chief Lithographer.

VOL. XIV, No. 2 WASHINGTON FEBRUARY, 1903

THE NATIONAL GEOGRAPHIC MAGAZINE

THE GREAT TURK AND HIS LOST PROVINCES

BY WILLIAM E. CURTIS

THE next, like the last, battle-ground of Europe will be the Balkan Peninsula, a group of petty states lying in the southeastern corner of Europe, bounded on the north by the Danube River, on the south by Greece and the Ægean Sea, on the east by the Black Sea, and on the west by the Adriatic. It is one of the oldest, yet one of the most primitive, portions of Europe, comprising the ancient Macedonian Empire. The people are described by Pliny and Herodotus. They fought Darius the Persian, and Alexander the Great. Julius Cæsar was planning a campaign against them when he fell in the forum with the dagger of Brutus in his breast. The story of the adventures of the Emperor Trajan among them is carved upon that marvelous column in Rome. Theirs was the last province to be added to the Roman Empire and the first to go to its dissolution. They then fell into the hands of the Turks, and for century after century submitted to the yoke of the Sultan, and were gradually submerged in political, moral, intellectual, and commercial oblivion. The existence of this once powerful people was almost forgotten until the Bulgarian atrocities, as they were called, excited universal horror twenty-five years ago and Russia intervened on the pretext of racial and religious relationship and attempted to take them away from Turkey; but the other powers of Europe prevented the Czar from enjoying the fruits of his victory over the Sultan and refused to permit him to have a port upon the Mediterranean. Ancient Macedonia was cut in half. The upper part was made an independent kingdom, called Bulgaria. The lower half, familiarly known as Macedonia, was restored to Turkey upon solemn stipulations that the people should have a Christian governor and a just and liberal government. That territory which appears upon the map as Eastern Roumelia, has recently attracted much attention from the civilized world because of the kidnapping of Miss Stone, an American missionary.

BOSNIA AS AN AUSTRIAN PROVINCE

Bosnia, the westernmost of the Turkish provinces, was placed under the pro-

tection of Austria, and has been the scene of a remarkable transformation from one of the most unhappy and hopeless places on earth to one of the most peaceful and prosperous. It is the more interesting because it happens to be the first Turkish province that was ever well governed. Nowhere else in Europe has there been so rapid an increase in population and wealth, and the picturesque old towns are taking on an air of activity. While subject to the Turks Bosnia practically vanished from the current of civilization until 1875, when, exasperated by extortion, robbery, rapine, murder, and religious persecution, the people rose in rebellion. The powers of Europe placed them under the protection of Austria, which has given the most remarkable exhibition of administrative reform known to modern history, and has demonstrated the possibility of governing alien races by justice and benevolence.

"Where the Turks are, there also are the wolves," is a Bosnian proverb. Another says: "Where the hoof of the Turkish horse strikes, the crops will come up very thin." Those proverbs were illustrated in an unmistakable manner in Bosnia, but one who visits that country today can scarcely believe that such conditions existed there only a short time ago. There were no railroads and few wagon roads. Brigandage was a recognized profession. Robbery was as common as lying. Murder was not considered a crime, and the number killed by the soldiers or by each other was not recorded. The British consul reported to his government that the average was ten thousand a year. Those who were compelled to travel went in large parties fully armed; farmers dared not build their cabins where they could be seen from the highway, and women never appeared in public alone, because it was unsafe. Today human life is as safe in Bosnia as it is in Illinois, and travel is even safer there, because there has never been a train robbery in that country. During the last ten years, out of a population of nearly two millions, the homicides have averaged only six a year, and in 1900 there were only two. There has been no case of highway robbery since 1895, and in 1900 but one case of burglary. Other crimes are equally rare.

The people are peaceful and contented. The cities are filled with new and handsome houses, factories have been built to utilize the water power, a university, colleges, schools of engineering, agriculture, and manual training have been established to qualify the people to make the most intelligent use of their opportunities. The population is almost evenly divided between the Moslem, Orthodox Greek, and Christian churches, with a few thousand Protestants and Jews. Members of the different religions mingle on amicable terms and show mutual respect and toleration. The courts are wisely and justly administered; justice is awarded to every citizen regardless of his religion, wealth, or social position; taxes are low and honestly collected and economically disbursed. The people have learned for the first time that honest complaints will be patiently listened to, and that wrongs will be remedied. Although the older peasants are still ignorant, backward, and distrustful, the younger generation show enterprise and ambition and are conducting their affairs with intelligence and order.

Enlightened Mohammedans have observed the advantages of the social, agricultural, and administrative reforms, and while no adult Moslem was ever converted to Christianity, they are adopting the customs and habits of the western world. The lives of the women are becoming enlarged. The wives and daughters of the Turks still wear veils in the streets, but are being released from the degrading position they occupy in all the lands of Islam.

Under Turkish rule all public worship was forbidden except that of Islam, and Christians and Jews were obliged to say their prayers in secret and pay blackmail to the local magistrates for the privilege. They were known as Rayahs—the word means ransomed—because, meriting death, they purchased permission to live by paying tribute. Western Christians do not appreciate the religious heroism which the poor peasants, not of Bosnia only, but of Bulgaria, Macedonia, and other Balkan provinces, have displayed during the long centuries they have suffered from the persecution of the Turks. They have lived in daily dread of martyrdom, yet have clung to their faith, when at any moment they might have secured safety, prosperity, and position by recanting and accepting the religion of their oppressors. These conditions still exist in Macedonia, and in Roumania the Jews are suffering more from the Christians than they ever suffered in Bosnia from the Turks. The Christians do not kill with the sword nor destroy with the torch, nor do they steal women for their harems, but they debar their Jewish fellow-beings from labor, drive them to distress and starvation, deprive them of education and the privilege of worship.

Through all the centuries that Bosnia was controlled by the Turks the people were without morality, education, arts, or sciences, and their industry was limited to the supply of their own wants, simply because when they possessed something they did not actually need, it attracted the rapacity of the officials. Occasionally some man like Nikola Tesla, the famous electrician, who is a native of Bosnia, broke through the restrictions and found an opportunity to develop his genius elsewhere; but under the Turks such cases were few.

Much of the cruelties endured by the people formerly were due to religious fanaticism. A peculiar sect of dervishes, called Ghazi, are holy men who go forth to slay the enemies of the Prophet until they are themselves slain, and as long as such fanatics are allowed to invade Christian communities, there can be no peace. Religious fanatics who commit murder for the faith in Bosnia are sentenced to have their bodies cremated after execution. This has driven them from the country. It is a punishment they dread more than death. To hang or shoot a Mohammedan is simply to send him to the paradise he is seeking, where he will rise again in his natural body in the presence of the Prophet. But if his body is burned or destroyed by any means, it is impossible for him to be translated, and his soul will remain forever in suspense.

Bosnia is broken by high peaks, deep glens, ridges, beautiful wooded hills, winding streams, and rich alluvial basins, which yield large crops of grain and are especially adapted to fruit. The landscape is a series of terraces which slope gradually southward and finally disappear in an archipelago of lovely islands, one of the most enchanting pictures in the universe, whose attractions have been the theme of poets ever since the days of Homer. It was on this coast during the Roman occupation that the Roman Emperor Diocletian erected his magnificent palace, which covered ten acres of ground, and for size, magnificence, and architectural display surpassed all human dwellings. The ruins are still sufficiently well preserved to fascinate the artist, the architect, and the archæologist, but the marble is being rapidly carried away to Italy and Austria for building material.

Sarajevo, the capital, is a city of 60,000 inhabitants, reached by a narrow-gauge road winding among the mountain gorges like the Colorado railways until it reaches the Adriatic at Metkovic, the port of Bosnia. The journey is interesting; the scenery is picturesque,

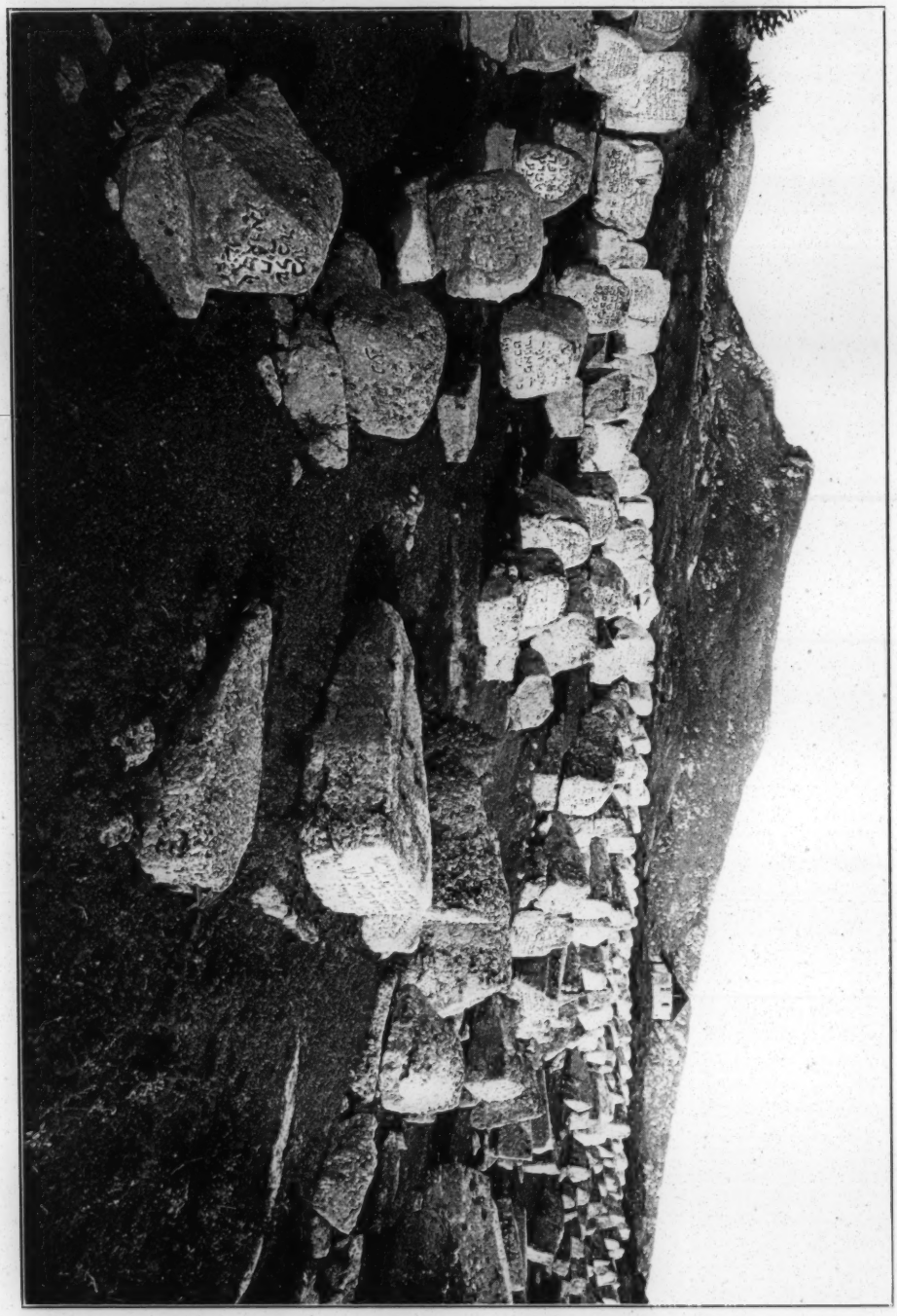
but that which most attracts the American traveler is the transformation of medieval castles into paper mills, tanneries, cigarette factories, woolen mills, and other practical purposes. Most of these enterprises have been aided by government subsidies, for the Austrians have considered it wise to encourage the introduction of foreign capital and immigration by offering substantial inducements in the way of free land and buildings, exemption from taxation and financial assistance. In this way they have provided employment for the women and others who are incapable of manual labor, and have afforded a ready and profitable market for agricultural products. There is excellent water power everywhere. Very little raw material is now shipped from Bosnia. The hides are tanned at home; the wool is woven into blankets, rugs, and carpets; the tobacco is manufactured into cigars and cigarettes; the wheat into flour; the fruit and vegetables are preserved, and all other proceeds of agricultural labor are increased in value and manufactured into marketable merchandise before they leave the country. Prunes are the largest item of export, and $1,500,000 worth were sold in the European markets in 1901. Beet-sugar factories have now been erected, and experts have been brought from Italy to educate the natives in the cultivation of silk.

In Sarajevo the ancient and the modern meet; the East and the West touch hands; the oriental with eternal composure listens to the chatter of the Frenchman and regards the gesticulations of the Italian with supreme contempt. The town is half Turkish and half Austrian. The old part looks like Damascus and the new part like Budapest, which, in many respects, is the handsomest city in the world. I was told that Sarajevo contained a larger variety of types of the original oriental races than even Constantinople, and that in the bazaars may be seen daily examples of every national costume worn from the Straits of Gibraltar to the Yellow Sea of China; and they all live together in peace and harmony, each recognizing the scruples of the other, permitting him to practice in peace the creed and customs of his faith.

Sarajevo compares well in architecture and in other respects with any other city of its size in Europe or America, and will some time be a beautiful and popular place, for it is much favored by nature, and the inhabitants are rapidly accumulating wealth. There are mosques with minarets and domes, churches of every religion, fine office buildings, apartment-houses, government edifices, and public institutions. The city hall is a beautiful modern structure of the oriental type, and the *Scheriatschule* or law college is imposing.

The old part of the city consists of crooked and narrow streets, lined with shops and bazaars opening upon the sidewalks, as in all oriental towns. The merchants and mechanics squat on their haunches or sit cross-legged as they make and sell their wares, but it is not sage for a stranger to purchase souvenirs of the country in those shops unless he sees them made, because most of the stock comes from the factories of Germany, France, and Austria. The different trades are governed by guilds, as was formerly the rule throughout Europe. Each guild has a patron saint and a long list of officers, who fix prices and profits, regulate wages, appoint apprentices, and decide disputes; but there is no eight-hour law. The busy artisans keep at it from daybreak to bedtime, seldom knocking off except to say their prayers at the nearest mosque, or drink a cup of coffee and make a cigarette at the nearest café.

The population of Bosnia at the time of the revolution is unknown. There had never been a census. More than



A Jewish Cemetery, Bosnia

two hundred thousand people fled across the border during the ten years previous to the Turko-Russian war to escape the cruelties and extortions of the Turks, and at its close the inhabitants had probably been reduced to less than eight hundred thousand. In 1900 the population had increased to nearly two millions, and is growing at the rate of about ten per cent a year, including representatives of every religion, especially Jews from Russia and Roumania. The Jewish burying ground is a curious place, ordinary granite boulders being used for headstones. The government respects the religious scruples of every citizen, and adjusts its laws and judicial proceedings to the requirements of the different faiths. The Austrian statesmen who have solved the Bosnian problem recognized the importance of a fact which many rulers in all parts of the world and at all periods have forgotten or overlooked, that conscience and religion lie deeper than any other influences that affect human action.

One of the most novel peculiarities of paternalism is the erection of fine hotels in different parts of the province in order that people who visit the country may be made comfortable and leave with pleasant impressions. These hotels are well kept, charge reasonable rates, and have not only been one of the most effective influences in bringing capital and new enterprises into Bosnia, but have been a profitable investment to the government.

Government Hotels, Bosnia

Another interesting and novel feature of the administration concerns the mili-

tary. Every young man must serve five years in the army. At eighteen he enters the active service for two years, and then serves for three years in the reserve corps, which is mobilized for two or three weeks annually for drill and instruction ; but no Bosnian soldier serves in his own country. He is sent to Austria or Hungary and stationed in some large town, where he can have an opportunity to rub up against the people and learn by imitation what he cannot be taught at home. If he marries an Austrian girl, he is allowed double pay, is exempt from certain guard duty, his wife is permitted to live in the barracks with him, and is employed as a cook or laundress or in some other capacity. Thus a great majority of the young men who leave Bosnia for military service return with Austrian wives and settle down as valuable citizens in the old towns. On the other hand, all military duty in Bosnia is performed by Austrian soldiers, who are offered similar inducements to marry Bosnian girls, and if they settle down in the province permanently, the government gives them farms or homes. Thus the country is not only being settled by an excellent class of young people, but the ties of relationship are linking it more closely to Austria every year.

One of the most interesting towns is Jajce, where St Luke is believed to have lived and died and to have been buried. Helena, the daughter of the last of the ancient kings of Bosnia, was given the remains of the apostle as a part of her dowry, and when Jajce was captured by the Turks, she escaped by a miracle and carried them with her to a convent at Padua, Italy.

BULGARIA

Bulgaria is about the size and shape of Pennsylvania, with nearly the same population, and its forests and rivers, the mountain ranges and rich valleys that lie between them remind one of the Quaker state. The Danube River forms the northern boundary and carries most of the commerce of the country, and along its banks are some fine old Roman ruins. Three-fourths of the population are engaged in agriculture and pastoral pursuits, cultivating little farms and following flocks and herds which graze at large. Theoretically all of the land belongs to the state, and those who occupy it pay one-fourth of all their produce for rent and taxes. The principal products are wheat, wool, and the oil of roses, which comes from the provinces bordering on the Black Sea. Philippopolis, a famous old town founded by Philip of Macedon 350 B.C., the second city in population and importance, is the center of the industry, and from that point eastward the entire kingdom is a rose garden. Roses are cultivated like grapes in France and Italy, so that all of the strength of the sap may go into the flowers, and in the summer women pluck the flowers as they reach maturity. Thousands of tons of rose leaves are gathered annually. The petals are carefully removed and the oil extracted from them by distillation. The oil sells from $50 to $100 a pound, according to its purity and specific gravity. A single drop will perfume a two-ounce bottle of alcohol.

The peasants of Bulgaria are industrious, ingenious, and intelligent. Both men and women are of fine physique, capable of great endurance, and few are idle, intemperate, or vicious. I saw but three or four beggars all the time I was in Bulgaria, and they were cripples. The women do their share of work on the farms, and never seem to be idle a moment. They spin as they walk along the highways and as they sit behind piles of fruit and vegetables in the markets. Most of the shepherds you see from the highways are women and children. The large herds in the mountains are kept by well-grown boys,

who sleep in the open air with sheepskins wrapped around them.

Hospitality is based upon the ancient oriental laws. No stranger is ever turned from the door if he comes in peace. The poorest peasant will share blanket and bread without the asking, and no visitor leaves a cabin without being offered a bunch of grapes, a mug of milk, or at least a glass of water. Each family has at least one pair of oxen, forty or fifty sheep, besides cattle, goats, pigs, geese, and chickens. Fruit is plentiful. The southern slopes of the Balkan Mountains are clad with vines, and the grapes produce an excellent wine. Tobacco and cotton grow well and all the vegetables known to temperate zones.

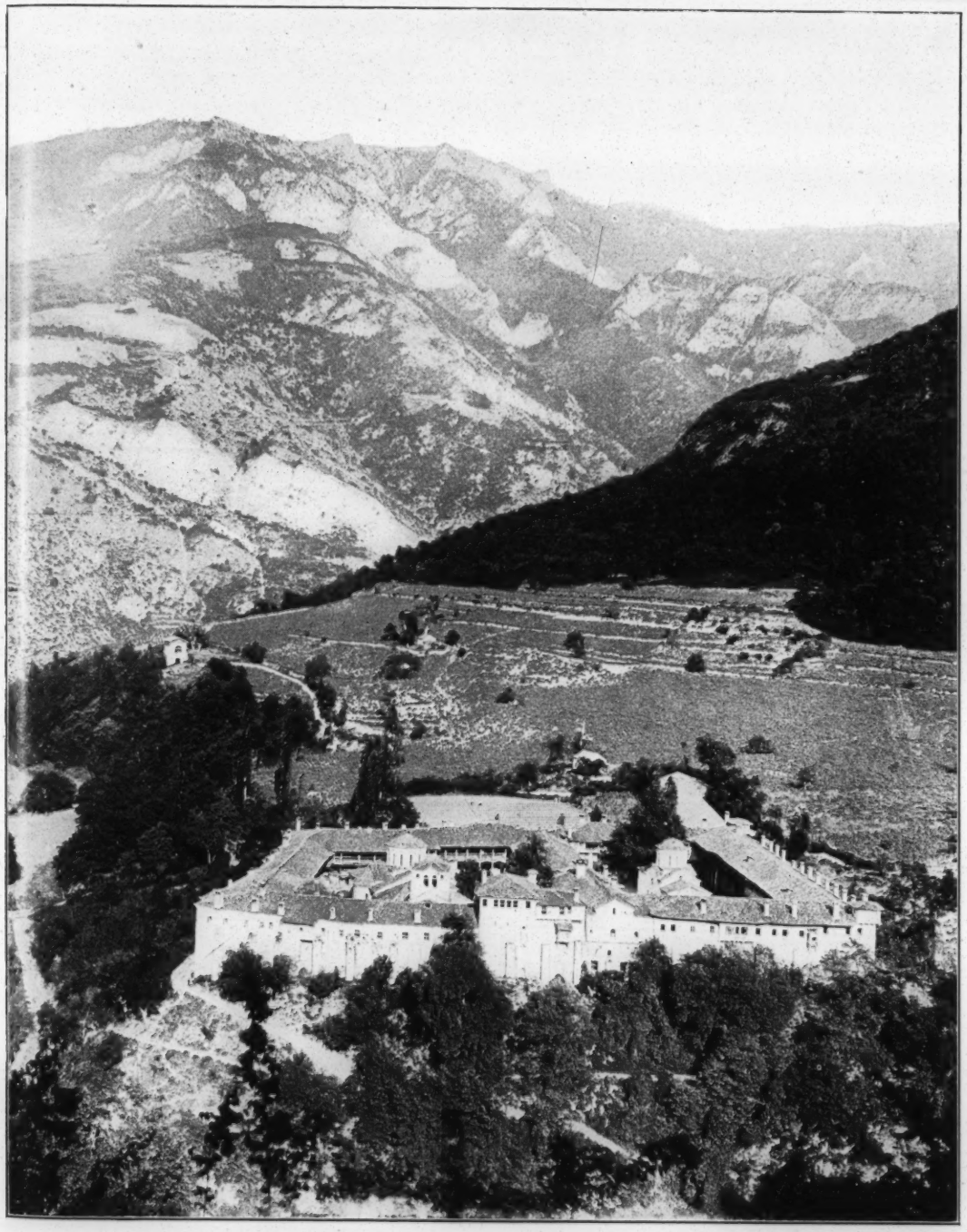
The great majority of the people belong to the Orthodox Greek Church; not more than one-fifth are Moslems. Their patron saint is St John of Ryle, a monk, who lived in a hollow oak in the mountains. A monastery, built upon the site of his retreat, is an enormous building of medieval architecture, frequently visited by tourists, who are hospitably entertained by the monks. It received considerable notoriety lately because of a report that Miss Stone was concealed there, and a thorough search was made by the soldiers. This profanation of the holy place excited great indignation among the orthodox Greeks, who blamed the American missionaries and threatened reprisals.

Its picturesque walls have often sheltered brigands, and in olden times its secluded situation made it a convenient rendezvous for enterprising gentlemen when tempted by favorable opportunities or oppressed by necessity. In return for their hospitality the monks were liberally supplied with game from the mountains, and are supposed to have received liberal contributions from the booty of their guests.

Around the picturesque city of Philippopolis are many ancient ruins, which should attract the interest of archæologists, but have thus far received very little attention. Perhaps that is because they are so far away. In Philippopolis there is quite a colony of Protestants, which last year erected the largest and finest Protestant church in the Balkan States. In Sofia there is another prosperous Protestant church. The principal school is at Samakov, where Miss Stone had been attending a teachers' convention before her capture.

The most influential woman in Bulgaria is Mrs Ivan Kassuroff, a former pupil of Miss Stone, who is notable as the first woman of social position in that country to enter mercantile business. Her character and abilities have not only carried her through a trying ordeal, but she has gained the respect and confidence of the entire community and has opened the field of commerce for women. When her husband, who was the proprietor of the principal bookstore in Sofia, died, he left her nothing but the good will of his business, and she was compelled to carry it on or become dependent upon others. Although no woman had ever undertaken such a task in Bulgaria, Madam Kassuroff assumed the responsibility. Now every one admires her and is proud of her success, and every hat is lifted when she passes along the street. She is a typical example of what American ideas, introduced by American missionaries, have done for the emancipation and advancement of women in the East. The government, as well as the public, has expressed its approval, and Madam Kassuroff is now the official printer and bookseller.

Sofia, the capital, is a city of 45,000 inhabitants, situated at the base of Mt Bitosch, a beautiful peak, 7,800 feet high. It covers a considerable area, and looks as if a building boom had been suddenly checked, which is true. Under the reign of Prince Alexander and Stefan Stambuloff, Bulgaria made



The Ancient Greek Monastary of St John of Ryle, Bulgaria

extraordinary progress, but under the present government very few improvements have been made. The business portion of the city will compare well with any place of similar size in France, Germany, or Austria. The business blocks are of modern architecture; the streets are wide and well kept; there are many apartment-houses similar to those in Vienna; the shops are filled with fine assortments of European goods—patent sweepers and furniture from Grand Rapids, agricultural implements and machinery from our factories, and Armour's canned goods; but what little commerce we have with the Balkan States is filtered through Austria.

Sofia, the Capital of Bulgaria

In the market places you see the costumes of nearly every oriental race. The Bulgarian is distinguished by the kalpak, a head-dress of lamb's wool, and the Turk by his fez. The Turkish women wear veils, but the Bulgarian women follow the European customs. The national costume is one of the most picturesque in Europe, and their outer garments are of wool grown and sheared upon their own farms, spun and woven in their own cabins, cut and made by their own hands. Formerly their cotton goods were imported from England and Germany, but the thrifty Bulgarians have learned the most valuable lessons of economy, and a little patch of cotton is now found beside nearly every cabin, which is planted, picked, ginned, spun, woven by the women like wool from their flocks. They are fond of bright colors, and the garments of both men and women are elaborately embroidered. A Bulgarian girl arrayed for her wedding or for a holiday is as pretty and picturesque an object as you can find outside of China or Japan, and a Bulgarian dandy is a delight. The sober-minded gentlemen wear long coats of white wool with full skirts and frogs, turbans of lamb skin, and high boots.

There is a fine club in Sofia, more im-

posing than can be found in any city of 46,000 population in the United States, and it is the center of social life. During the reign of Prince Alexander, a military barracks, public printing office, a technical school, a riding academy, and other creditable government buildings were erected. Several mosques have been converted into prisons, markets, warehouses, and arsenals. The largest, only a stone's throw from the palace, is now being fitted up for a national museum. There are two hotels with comfortable rooms and excellent tables; electric street cars run in every direction; the streets, public buildings, and houses of the rich are lighted with electricity, and other features of modern civilization are quite as advanced as may be found in any other city of Europe.

In the older quarters of the city are seen long rows of ancient wooden houses with latticed windows, and by that sign one may know the residence of a Turk, who thus shields the women of his family from the public gaze; but there are now comparatively few Moslems in Bulgaria, and they are leaving rapidly.

The Berlin conference told the people of Bulgaria that they might choose their own prince, and the National Assembly selected Prince Alexander of Hesse, a nephew of the Czar of Russia, a grandnephew of Kaiser Wilhelm the Great, and a brother-in-law of Queen Victoria's daughter Beatrice. He was a great favorite with everybody—brave, unselfish, patriotic; and ambitious to promote the welfare of the people, but too honest and candid to cope with the conspirators by whom he was surrounded. Russia was disappointed because the other powers had deprived her of the fruit of her victory over the Turks, and determined to obtain control of Bulgaria by intrigue. Anxious to preserve its independence, Alexander refused to comply with the Russian demands, encouraged the democratic spirit of the people, and assumed the leadership of the anti-Russian party. The Russians retaliated by one of the most scandalous conspiracies since the days of the robber barons. The Prince of Bulgaria was kidnapped in his own palace by his own officers, driven over the mountains, and placed upon a Russian yacht in the Danube. European sentiment compelled his restoration and the Czar evaded responsibility, but not one of the Russian officials engaged in the plot was ever even reprimanded.

Alexander was enthusiastically welcomed by the people, but, with characteristic frankness telegraphed the Czar that he had received his crown from Russia and was ready to surrender it whenever demanded. The Czar compelled Alexander to abdicate, but not until after he had given him a pledge that the Bulgarians would be permitted to manage their own affairs without interference—a pledge that has been daily violated.

Alexander's successor and the present Prince of Bulgaria is Ferdinand of Saxe-Coburg and Gotha, a grandson of Louis Philippe of France, and a cousin of nearly every crowned head in Europe. Ferdinand is the opposite of Alexander in character, motives, and ambitions. He is selfish, fond of display, of extravagant habits, and the gratification of his own vanity is of greater importance to him than the progress and welfare of his people. For the first two or three years he got on without friction, but his queen, Marie Louise of Bourbon, yearned for the social recognition of the court at St Petersburg and was ambitious for her children. Through her influence he yielded to the demands of the Czar, and the active ruler of Bulgaria has since been the diplomatic agent of Russia at Sofia, now Mr Bakhmeteff, a diplomatist of great talent and long experience, who is well known in Washington, having married the daughter of the late General Edward F. Beale.

Stefan Stambuloff was the greatest man the Balkan States ever produced,

and was the Prime Minister of Bulgaria under Prince Alexander and Prince Ferdinand until the latter adopted a pro-Russian policy, when he retired and was succeeded by a man of Russian sympathies. He became the leader of a formidable anti-Russian party, until removed from the whirl of Bulgarian politics by assassination in July, 1895. The assassin was recognized as Michael Stavreff, a pro-Russian politician who was also accused of the murder in 1892 of Mr Vulkovich, a diplomatic agent of Bulgaria at Constantinople, second to Stambuloff in influence among the anti-Russian party. Until October last Stavreff was allowed to go unpunished, and was a familiar figure about the cafés of Sofia. He was pointed out to me and to every one as Stambuloff's assassin, and appeared to be proud of that notoriety.

In October, 1902, he was arrested, tried, convicted, sentenced to death for the two murders by order of Mr Ludskanoff, Minister of Interior and leader of the Russian sympathizers, who was banished by Stambuloff for treason. Immediately after the sentence of Stavreff, there appeared upon the streets facsimile copies of letters showing that Ludskanoff had employed him to commit the two murders, and similar facsimiles of other letters have appeared at frequent intervals since. It is the popular belief that Ludskanoff, fearing Stavreff's reckless tongue, attempted to put him out of the way, and that the latter's friends have disclosed the correspondence to involve the minister in the crime.

Stavreff has not been executed; the Prime Minister, Mr Karachoff, still permits Ludskanoff to remain in the cabinet; the government ignores the situation, and the friends of the minister claim that the general amnesty granted political exiles after Stambuloff's assassination was a full pardon for any crime in which he might have been involved before that date.

Stambuloff lacked polish and education; he was arbitrary and despotic, but his entire career is an example of unselfish integrity and patriotism. He lived and died for the independence of Bulgaria, and had the full confidence of Prince Alexander. Had those two men been permitted to carry out their plans, the country would have had peace, progress, and prosperity; but conspiracy triumphed, patriotism was repressed, and but for the strong hand of Russia its condition might have been worse than it is. The treasury is empty, the national credit is exhausted, and the hysterical emotions of sympathy that are stirred by the sufferings of their kinsmen across the border keep the people in continuous turmoil.

MACEDONIA

The Bulgarian atrocities have been repeated in Macedonia for over twenty-five years, and have grown worse and worse, until the country has been almost depopulated. Human life and property are held as worthless by the Turkish officials. No woman has been safe from their lust; no man has been allowed to save money or produce more than enough to supply his own wants. The Christian population have no standing in the courts, no remedy for injustice and extortion, and the world would be shocked if the truth were known; yet year after year the jealousy of the powers of Europe permit these conditions to continue.

An occasional insurrection or lawless incident in which a foreigner has been the victim, like the kidnapping of Miss Stone, has attracted public attention, and remonstrances are frequently filed at the Sublime Porte by the European ambassadors, in which the Sultan is warned that anarchy and barbarity will not be tolerated longer and admonished to repent and reform. It must amuse His Majesty to read the signature of the German ambassador at the bottom of these notes, and we can imagine his

large, sad eyes grow merry at the farces so frequently enacted at the Yildiz Kiosk when the representatives of the powers appear in their radiant uniforms to remonstrate against his inhumanity to his Christian subjects. He realizes and he knows that they realize that the slightest interference by force on the part of any of their sovereigns will provoke an even more emphatic remonstrance elsewhere for fear some commercial or political advantage may be gained; and when his situation becomes serious he grants another profitable concession to some German syndicate as an additional policy of insurance against intervention. Germany is more culpable than any other nation, because its government sustains and protects the Sultan in his atrocious barbarisms not only in Macedonia but in all parts of the near East.

Von Moltke prophesied that a universal war would be fought under the walls of Constantinople, and the Bulgarians are trying to provoke it. What is known as the Macedonian Committee is an organization to which every Bulgarian belongs. Its headquarters are in one of the most conspicuous buildings upon one of the most prominent streets of Sofia. Its meetings are public. It issues a weekly newspaper in which its purposes are announced and its plans

House of the Sobranye (Bulgarian National Assembly), Sofia

Prince Ferdinand of Bulgaria

discussed. It is sustained and encouraged by the Bulgarian government and assisted by liberal contributions from Russia. The plot to kidnap Miss Stone was hatched in the Macedonian Committee, and her ransom, paid by the American people, was undoubtedly expended for arms and ammunition. The object was, first, to punish the American missionaries who had refused to contribute to the Macedonian cause; second, to attract the attention of the Christian world to the anarchy and barbarism that exist in Macedonia; and, third, to involve the United States government in hostilities with Turkey.

How long the powers of Europe will permit the Sultan to defy them is a question often asked, both in private and public, and never answered. It is probable that trouble will ultimately arise through collision between the Bulgarian patriots and the Turkish troops in Macedonia. They occur frequently. Scarcely a month passes without a battle on the border. If Bulgaria makes a complaint, Turkey replies that the government is trying to suppress brigandage. Some time, however, the Bulgarian people will not be satisfied with that answer. They will insist that their government demand reparation of Turkey and make a hostile demonstration that will attract the attention of Europe. This would have occurred long ago but for the inability of Bulgaria to raise funds to equip and pay an army, the indifference of Prince Ferdinand, and the lack of leadership.

In the meantime the Sultan is buying guns in anticipation of trouble. We often hear that the Sultan is insane, that he is suffering from a neurotic disease caused by insomnia, anxiety, and fear; yet no diplomatist of ancient or modern times has been more skillful or successful in playing upon the rivalries of his enemies.

SERVIA

The small but restless State of Servia obtained its independence from Turkey early in the nineteenth century, under the leadership of a nameless peasant. Because of his swarthy complexion and raven hair they called him Kara George, which means "Black George," and Karageorgeovitch is the name of his descendants. Milosh, a companion of Kara George in the fight for liberty, was a farm servant of a widow named Obren, whose name he adopted when he needed one, and Obrenovitch is the family name of the present king. The feud between the two families began in 1817, when a Turkish pasha hired Milosh to assassinate his friend as he slept, and the history of Servia has since been a continuous duel between their descendants, encouraged by Turkey and Russia, which have been con-

tending for the control of the Balkan Peninsula.

The present king, a repulsive degenerate, and his queen, Draga, are boycotted by all the courts of Europe because of their immorality. The Karageorgeovitch family are in exile, Peter, the head of the house, being engaged in scientific pursuits in Switzerland. King Alexander looks as if he had escaped from an asylum for the depraved, but has a vigorous constitution, and on occasions has shown great nerve and

King Alexander of Servia

power of command. Unfortunately he has inherited all the vices of his father, the late King Milan, who was the worst ruler Europe has seen for a generation. While getting his education in Paris he acquired habits which unfitted him for the responsibility of governing a primitive and restless people like the Servians. He squandered the public money and lost his private fortune at cards, and his wife, Natalie Keskho, daughter of a colonel in the Russian army, was compelled to leave him and finally obtained a divorce. She now resides at Biarritz, very much respected and beloved, although she made herself unhappy and excited the hostility of the Servian politicians by her unconcealed Russian sympathies. The scandals of the Servian court furnished gossip for all Europe, until finally, enervated by dissipation and despised by all his subjects, Milan abdicated in favor of his young son, Alexander, and went to Vienna to die.

Alexander was a precocious prince, and when only fifteen years old fell under the fascination of Madam Draga Maschin, who had been a lady in waiting to his mother and is about ten years older than he. She is an ambitious, brilliant woman, gifted with considerable beauty and a charming manner. Madam Draga had more influence with the King than his parents, the ministry, and the court, and when he was seventeen persuaded him to marry her and assume the reins of government. From that time until now the Servian court has been the scene of a series of sensations which are likely to continue indefinitely.

The palace, in the center of the city, is a pretentious structure, which rises next to the public street without grounds, and was built by Milan, the gambler king, with an eye to entertainment and display. Within is a series of magnificent apartments equal to those in the palaces at Berlin and Vienna, designed by a French architect, and furnished with an extravagance that threw the country almost into bankruptcy. The great drawing-room, in which the king received the officials, the diplomatic corps, and the public every Sunday morning, is one of the finest in the world.

You reach Servia by railroad through Hungary across a country that looks very much like Kansas and Nebraska. Servia is called a poor man's paradise,

because the soil, climate, and other conditions are favorable to people of small means. Eighty-seven per cent of the 2,400,000 inhabitants are engaged in farming, and there is no country in which the land is so equally distributed, for there is one farm to every eight inhabitants. Fruit culture is the largest source of profit. The prunes of Servia are the most popular and bring the highest price in foreign markets. All other kinds of fruit are grown and preserved, and grains, vegetables, and dairy products are shipped in every direction. Flocks and herds are large and multiply rapidly, and the people are always prosperous except when a war or a revolution is on.

Belgrade, the capital, lies upon a promontory where the river Save joins the Danube. The modern part of the town is quite attractive; the ancient part, built centuries ago, during the Turkish dominition, is picturesque. The modern streets are wide and lined with fine buildings after the Austrian style of architecture. Some of the school buildings are excellent samples of modern constructien and show an educational enterprise that is creditable to the country. There is a compulsory education law, free schools, and free books; a number of academies, schools of commerce, agriculture and fruit culture, and a university with four hundred students. The government supports a museum, an art gallery, and a theater for the encouragement of native dramatists and opera writers. At the extreme point of the promontory, rising abruptly from the river to a height of 400 feet, is a citadel erected by the Romans before the time of Christ. The castle is in an excellent state of preservation, is used for a prison, a barracks, and a military school, and is the headquarters of the army. There are no paupers in Servia, and therefore no almshouses, but there is a free hospital for both military and civilian patients, which is well kept up. The Bourse is a fine building, also erected by a French architect, and reminds you of the modern structures of Marseilles and Havre. The fever of speculation is as great in Servia as anywhere, and exciting scenes are happening frequently on the Bourse, particularly when political disturbances occur.

The ancient part of the city has remained unchanged for centuries. The walls of the citadel were built by the Romans, and stand as they left them, after having sustained the attacks of hundreds of armies and some of the most famous sieges in history.

The political crisis in Servia just now is caused by the lack of a baby. In the absence of a natural heir the constitution of the country requires the King to designate his successor, and the neighboring powers are endeavoring to assist in the selection. The daughter of the Servian cattle dealer reached the throne by a series of sacrifices and intrigues more sensational than often occur outside of fiction; yet she is not happy, and never will be until she is socially recognized by the other royal houses of Europe, to whom this clever adventuress is offering the throne of Servia as the price of such recognition. Negotiations have been going on for a year or more with Russia. Queen Draga promises that the King will proclaim Prince Mirko, of Montenegro, heir apparent, provided she and her husband are invited to spend a few days in Russia as the guests of the Czar; but the Czarina, who is a pure woman, has absolutely refused to receive her.

Prince Mirko is a brother-in-law of the King of Italy, and two of his sisters have married Russian archdukes. He was educated at St Petersburg, is a great favorite of the imperial family, and Queen Draga could not have selected a candidate more agreeable to them or satisfactory to the other powers. Furthermore, another of his sisters mar-

ried Prince Peter, the present head of the Karageorgeovitch family, which approves of his selection; and thus, if he were to reach the Servian throne, the feud that has wrecked that country might be permanently healed. The success of this arrangement, involving the peace of Servia, the supremacy of Russia in its government, and perhaps the political control of the Balkan Peninsula, is checked by the refusal of a good woman to receive a bad woman as her guest. Count Lamsdorff, the Russian Minister of Foreign Affairs, has recently visited Sofia and Belgrade, and the newspaper dispatches from those countries predict events of importance to occur soon.

THE WORK OF THE U. S. HYDROGRAPHIC OFFICE*

BY COMMANDER W. H. H. SOUTHERLAND, U. S. N.,
HYDROGRAPHER

I APPEAR before you this evening to describe the work of the U. S. Hydrographic Office, and in so doing I shall make an earnest effort to give you as definite an idea as possible of the character, mode of operation, and the valuable practical results of this the most unique and at the same time the least known of all the technical offices supported by our government—unique in that it is the only office on this continent which publishes charts, sailing directions, and other necessary aids to navigation relating to foreign countries, and little known in that its work is principally for a particular class—the seafaring class.

ORGANIZATION AND HISTORY OF THE OFFICE

Before proceeding with this description, a short résumé of the phases through which the office has passed from its inception to the present time may prove of interest.

Prior to 1830, whenever a naval vessel was in need of charts or nautical instruments it was the custom for the commanding officer to forward to the Board of Navy Commissioners a requisition for such of these articles as he deemed necessary. This requisition, when approved by the board, was sent to the navy agent at the port where the vessel was fitting out, who filled it as far as possible by purchase from foreign governments or from the few private dealers in this country. These purchases were afterwards supplemented during the vessel's cruise by such additions as were from time to time deemed advisable by the commanding officer; and at the end of the cruise, when the vessel was put out of commission, her charts and instruments were turned in at a navy yard, where they were stowed away and no further attention was paid to them until they might be needed again.

The result, of course, was that very often needed charts could not be purchased and delivered before the date of sailing, or instruments were placed on board without being adjusted or standardized, and it was very seldom that charts so purchased had been corrected up to date. In fact, no official means then existed by which mariners could

* An address before the National Geographic Society, January 16, 1903.

be informed of necessary corrections to their outfits of charts.

To obviate as far as possible the dangers to navigation resulting from such a lack of system and care, the Secretary of the Navy in 1830, upon a recommendation from the Board of Navy Commissioners, directed the establishment of a depot of charts and instruments, under the charge of the late Commodore Goldsborough, then a lieutenant. This was the inception of the Hydrographic Office, the province of which for the first five years of its existence was simply to purchase, correct, and keep on hand charts and instruments for our naval vessels only.

It was not until 1835 that any effort was made to construct our own charts. In that year a lithographic press was purchased, and in the following year the first charts actually executed by the depot appeared for issue to the service and merchant marine.

In 1842, the bureau system of the Navy Department was established by act of Congress, the depot of charts and instruments being attached to the Bureau of Ordnance and Hydrography, to constitute the hydrographic branch of that bureau.

Lieutenant Maury had in the meantime been detailed to duty in this depot of charts and instruments, and in 1844, upon the completion of the Naval Observatory building (which was afterward frequently officially designated as the Naval Observatory and Hydrographic Office), the depot of charts and instruments was moved into that building, Lieutenant Maury becoming the Superintendent of the Naval Observatory and Hydrographic Office.

Lieutenant Maury devoted the greater part of his energies to hydrographic subjects, and for the seventeen years during which he had charge of this office did more in the interest of the merchant marine than was accomplished by similar branches of all foreign governments combined. He began the collection of information from the logs of men-of-war and merchant vessels for the purpose of constructing nautical charts to show the prevailing winds and currents, their limits and characteristics, and, in general, the physical features of the ocean, and all facts of interest or value to the maritime community. This was continued during the seventeen years he remained in charge, and resulted in the issue of wind and current charts, track charts, trade-wind charts, whale feeding ground charts, thermal charts, storm and rain charts, and eight large volumes of sailing directions, all of which were concerned with the safe navigation of the known waters of the globe. In addition, there were issued nearly fifty charts of different sections of the world, which were printed from engraved copper plates.

On the breaking out of the civil war Maury cast his fortunes with the South, and his practical labors for the Navy and merchant marine ceased. He was succeeded by one of the most accomplished officers in the service, the then Commander Gillis, and the Hydrographic Office during the four years of the civil war gained an excellent reputation in and out of the service through its ability to keep our war vessels supplied with the latest charts, nautical publications, and other necessary aids to safe navigation.

The work of the office was so strictly navigational in character that shortly after the civil war began it was transferred to the Bureau of Navigation, under which bureau it remained until 1898, when it was transferred to the Bureau of Equipment, under the direction of which it now remains.

In 1866, the year after the ending of the civil war, the connection between the Naval Observatory and the depot of charts and instruments was severed by law. An act of Congress passed in that year established "A Hydrographic Of-

fice for the improvement of the means for navigating safely the vessels of the Navy and mercantile marine, by providing, under authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instructions for the use of all vessels of the United States, and for the benefit and use of navigators generally." The act further provided that the Secretary of the Navy be authorized "to cause to be prepared," in the Hydrographic Office thus created, such "maps, charts, and sailing directions, and nautical books relating to and required in navigation, and to publish and furnish them to navigators at the cost of printing and paper, and to purchase the plates and copyrights of such existing charts, maps, sailing directions, etc., as he may consider necessary."

The spirit and intent of this act of Congress have been carried out from that time to this with unceasing energy and with a degree of zeal, ability, and intelligence which would reflect credit upon any branch of our government, and this has been done at the minimum of cost and under difficulties which at times seemed almost insurmountable. From the small depot of 1830, with a working force of two officers and one nautical expert, it has expanded to an establishment with a working force of nearly ninety technical and skilled employees, supplemented by sixteen fully equipped branch offices at the most important points on our Atlantic, Pacific, and Gulf seaboards and on the shores of our Great Lakes.

SURVEYS BY OUR MEN-OF-WAR

No vessel starting on a voyage is properly equipped unless her navigational outfit includes accurate charts, sailing directions, light lists, and other necessary aids to navigation for all places to be visited. The Hydrographic Office is charged with producing this navigational outfit of necessary charts, sailing directions, etc., for all parts of the world not under the jurisdiction of the United States, and in performing this duty there is no quarter of the habitable globe the waters of some portion of which have not been surveyed by vessels of our own Navy.

In general, the charts referred to are constructed from surveys made by the officers and crews of men-of-war. As there can be no question as to the necessity for an accurate knowledge of the waters of the globe, our naval vessels are supplied with an outfit for hydrographic surveying. With their large crews, numerous boats, and with officers trained to the actual requirements of all practical navigational aids, it is clear that this service is one for which the Navy is particularly well adapted in times of peace—a service which, in general, can be performed without interfering with other naval requirements, and with results which inure to the benefit of all mankind. And it is a pleasure to state that the service is one which is not considered distasteful in the Navy. Frequently, due to the exigencies of diplomatic relations and for other reasons, our vessels are stationed in foreign waters for long intervals of time, during which the officers and crews generally welcome surveying work as a decided break in the monotony of their confinement to the limits of the ship. During the last fiscal year not less than 24 naval vessels engaged in practical surveying operations in many parts of the world, the results of which will be of incalculable benefit to our maritime and commercial interests. At the present time a number of our men-of-war are similarly engaged in very important localities.

In addition to the resulting benefit to our maritime interests, the naval service is also materially benefited. The work tends to bring out the officer's powers of observation of things nautical and to give him a familiarity with coast

work which becomes invaluable in time of war.

This was well exemplified during our civil war, when the most successful blockade-runners were commanded by men, generally ex-naval officers, who had been engaged in the Coast Survey in the vicinity of their blockading operations. If this was then true of our own coast, how much more so will it be of foreign coasts in the event of any future war! This fact was also evidenced during the late Spanish-American war. Nearly all of the many officers who distinguished themselves during that period, particularly those who occupied ranking positions, had seen good surveying service either in the Navy or in the Coast Survey. This I have taken the liberty of demonstrating by the exhibition of a few charts—one the result of the work of Admiral Dewey, one that of Admiral Charles E. Clark, and one that of the late Admiral John W. Philip.

Lack of space only prevents exhibiting equally good work by many other of our prominent officers, but I cannot properly let the opportunity pass without calling attention to some of our many naval officers whose work in hydrographic surveying will never be forgotten: Commodore Wilkes on the Grand Banks and in the Pacific and Antarctic, Commodore Perry in the waters of Japan, Commodore Rodgers and Commanders Berry and Stockton in the North Pacific and in Bering Sea, Lieutenant Lynch in the Dead Sea, Admirals Belknap, Erben, Barker, and Tanner in the Pacific and elsewhere, and Brooke and S. P. Lee in the Atlantic. Captain Mahan, our most noted authority on naval subjects, was also an expert hydrographic surveyor. Admiral Porter and many of our most distinguished naval officers of the civil war had performed good work in the Coast Survey, and Pillsbury's work in the Gulf Stream is well known.

CHART CONSTRUCTION

I shall now briefly sketch the course of chart construction. In general, a preliminary sheet of the work done, prepared with accuracy and with a sufficient degree of delicate draftmanship to clearly demonstrate any inaccuracies as the work progresses, together with the records of astronomical observations, triangulation, topography, tides, currents, etc., is forwarded from the surveying vessel to the Hydrographic Office, where, in the Division of Chart Construction, now presided over by one of the most thoroughly equipped hydrographic engineers in this or any country, the work is carefully revised in every detail and a smooth sheet prepared, from which comes the working chart, either from an engraved copper plate or by a lithographic process. As soon as the finished chart is printed, all vessels of the Navy serving in the locality which it indicates are supplied therewith. The merchant vessels of all nations can obtain it by purchase from the Hydrographic Office or from any of its numerous agents.

As soon as received in the Hydrographic Office, the work is made a matter of record and the history of the chart commences, not to end until the chart becomes obsolete or is canceled by another. Every correction, alteration, or addition, with the names of all connected therewith, becomes a matter of record which is carefully guarded. While sometimes, for good and sufficient reasons, the legend on the chart does not show the authority, that information is contained in its record.

GENERAL CHARTS, COAST CHARTS, AND HARBOR CHARTS

And now let us see what these charts are, what they show, and of what use they are to the mariner. Generally speaking, navigational charts are of three classes—general charts, coast charts, and harbor charts—the coast

charts occasionally being divided into special and general.

General charts, as the name implies, cover a large territory, and are principally for the use of navigators in the open sea, as in making long voyages. This class of chart is necessarily upon a small scale, and represents not only the character of the ocean bed as thus far delineated by deep-sea soundings obtained by vessels of the principal maritime nations, but also the shore lines with the most prominent topographical features, the principal seaports, the lighthouses which are of use in off-shore navigation, all dangers in the nature of shoals, reefs, and rocks, and the lines of equal magnetic declination or variation; compass stars, showing both true and magnetic directions in degrees and quarter points, are placed where it is thought they will be of the greatest use. On this chart the navigator plots his geographical positions as often as they are determined, and thus is able to keep as nearly as possible a direct course to his port of destination. This chart is kept in use until the vessel gets within the limits of the coast chart, when it is put away and replaced by the latter.

Coast charts, both general and special, delineate the coasts of all countries, and for each coast are consecutive and take in such sections of the coast as will permit of the use of a comparatively large scale. The coast line is accurately delineated, as are also the principal topographical features which can be used in navigation; all the lighthouses, with their peculiar characteristics; the life-saving stations, Weather Bureau stations, and all the features which in any way can enable an observer by bearings, or otherwise, to determine his position. The soundings are frequent and, in general, are run out to the 100-fathom curve. With the aid of this coast chart, the navigator pilots his ship along shore until within the limits of the chart of the harbor to which he is bound, when that replaces it.

The harbor chart is on a larger scale than the others and in greater detail. Every object on shore that can be used in piloting the ship in or out of the harbor is delineated in its correct position. Where possible, ranges to guide vessels in and out are determined and plotted upon the chart; lighthouses, range lights, buoys, beacons, and all daymarks are plotted; the positions of landing places, custom-houses, and public buildings of which the navigator may have occasion to know are plotted, where possible; curves of certain equal depths of water, quarantine stations and quarantine grounds, men-of-war and merchant ships' anchorages are also clearly indicated; the magnetic declination or variation is noted on one or more compass roses, and in addition the chart contains all necessary data as to the date of publication, the date of the latest correction, the character of the soundings, heights, signs, and abbreviations, and all necessary tidal information. On these charts, as on coast charts, the shore lines are made especially conspicuous, and the topographical features represented are such as will be of actual value as aids to navigation.

USE OF SURVEYS BY OTHER NATIONS

I have only referred to original surveys by our own vessels; but it must not be understood that the chart construction work of the Hydrographic Office ends with these. We all realize that in time of war it would be a difficult matter (perhaps an impossible one) to get correct navigational charts of foreign places against which our Navy might have to operate, and during peace periods it takes time to obtain the latest editions of foreign charts. All the great maritime nations recognize the fact that it is a matter of national moment for them to be possessed of all available charts of every part of the world, and

for this reason they make it a practice to use the published surveys of other Powers as data for the construction of charts of their own. We are compelled to do likewise, and little by little are utilizing the surveys of those foreign nations, the work of which is known to be reliable. This is a matter of discrimination, but experience has shown the necessity for discrimination. Many charts of the Philippines, of Cuba, and of islands of the West Indies have been found to be inaccurate.

This use of foreign work is not only in the direction of a proper preparation for possible times of national peril, but in the end is a matter of economy. Were this practice not carried on, it would be necessary to purchase our charts from foreign nations—a source of supply which would be closed to us in time of war—and, when purchased, the corrections made necessary by newly discovered dangers and by changes in buoyage, ranges, lighthouses, etc., would have to be plotted by hand, which is more expensive than making the necessary changes on the plate from which the chart is produced.

AREA COVERED BY OUR CHARTS

At the present time the Hydrographic Office has in its possession nearly 1,200 engraved chart plates and about 50 photographic chart plates. These 1,250 plates have all been constructed from the results of original naval surveys; from geographical and cartographical data reported by the commanding officers of vessels in the naval service; from information collected by the branch hydrographic offices from incoming mariners of all nationalities, and also from the geographical information that comes into the custody of the Navy Department through the prosecution of surveys by foreign governments.

These charts represent about one-third of what are actually necessary for a complete set of navigational charts of the world for the use of the naval and shipping interests of the United States.

Besides the projecting, drawing, engraving, photographing, electrotyping, and printing, which constitute the central work of chart construction and chart correction, the functions of the Hydrographic Office embrace all that is kindred and contributory to the construction of charts, and hence include the mathematical computations for the projection, the adjustment of triangulations, the investigations of the tides, the discussion of observations of the magnetic elements of the earth in their bearing upon charts and navigation, the computation of navigational tables, and the designing of instruments and machines for securing maximum of economy.

Of the 1,250 or more charts that are now available for permanent issue, over 300 have been derived from original surveys by the U. S. Navy. These, added to the 450 or more charts that have been constructed from surveys by the Coast and Geodetic Survey, make a grand total of 750 or more navigational charts constructed from original United States surveys, a result which places our people ahead of most of the older countries and in the front rank of the most active nations in marine hydrographic work.

It must not be understood, however, that if we were to become possessed of engraved plates representing the charts now issued by all other nations we would be able to produce navigational charts covering the world's entire water area. Very much remains to be done before the hydrographic features of the world can be so charted as to warrant the statement that dangers to navigation due to lack of knowledge of geographic positions and correct soundings have been reduced to a minimum.

There are numerous places in the West Indies which we know to be inaccurately charted, and this same statement applies to locations in nearly all parts of the world. In the North Pacific Ocean

alone there are thousands of reported dangers. Many of these are probably either inaccurately located or do not exist, but all the same they are a hindrance to navigation through the anxiety and loss of time which the fear of their possible existence causes to shipmasters. Fortunately, little by little the national vessels of the Great Powers are either accurately locating or disproving the existence of many of these. I am glad to say that our own naval vessels have done their share in this good work.

DEEP-SEA SOUNDINGS

Our knowledge of the depths of the sea is gradually increasing through the operations of deep-sea sounding expeditions undertaken by many nations. In this field of operations we hold a commanding position. From a scientific point of view, a knowledge of the physical characteristics of the ocean bed is most desirable, and no less so from a practical standpoint. No telegraph company would think of laying a submarine cable today without first selecting a desirable route as determined by deep-sea soundings. The soundings of the U. S. S. *Nero* in the Pacific two years ago determined the route since selected for the transpacific cable.

Deep-sea soundings are also of especial value to the mariner, inasmuch as from their results the existence of submarine dangers is frequently indicated. In the Atlantic the greatest accurately known depth in the fifties was obtained by the then Lieut. S. P. Lee, in the U. S. brig *Dolphin*, 3,825 fathoms (4⅓ miles). Only a year ago the now greatest known depth in the Atlantic, 4,662 fathoms (5¼ miles), was found by the present U. S. S. *Dolphin*, the first vessel of the new Navy. The greatest known depth in the world is in the Pacific, and is 5,269 fathoms (31,614 feet), 66 feet short of 6 statute miles. This depth was obtained by the U. S. S. *Nero* in 1900, and is greater than any elevation on our continent, or, as far as we know, in the world.

SAILING DIRECTIONS

The Sailing Directions, to which I have previously referred, can properly be designated as nautical guide books—in other words, nautical Baedeckers. The coasts of the world are divided up into numerous sections, for each one of which a book of sailing directions is prepared. Thus we have Sailing Directions of the East Coast of South America, etc. These seamen's guide books, when complete and used in connection with the corresponding navigational charts, are supposed to give the mariner all the information that he may require for safely navigating the part of the world considered, and for entering and leaving each harbor or anchorage therein. When corrected to date, they give him in as much detail as possible, a knowledge of the prevailing winds and weather for each season; of the tides, currents, buoys, lights, and other day and night marks, and of proper anchorages. In addition, where possible, ranges to be used in entering and leaving port, both by day and night, are described; prominent landmarks and other topographical features are noted in detail, and everything in the way of an aid to navigation is entered therein. They even go so far as to give him information in regard to port dues, local regulations of foreign governments, diplomatic customs of the local and state authorities, the facilities for obtaining provisions, water, and other supplies, and also as to obtaining necessary repairs.

There is no guide book known which contains so much of practical importance. In all nations these books are written by naval officers or by others who have followed the sea for a profession—men who have had sufficiently matured practical experience to enable them to exercise proper judgment in weighing

the many varied sources of information, to reconcile conflicting statements, to set forth only the facts upon which the mariner can rely with confidence, and to exercise a care in their preparation commensurate with the interests of life and property at stake.

AIDS TO NAVIGATION

The aids to navigation required by mariners are numerous, but I shall only speak of those which are prepared and issued by the Hydrographic Office. With due regard to sequence, the Notices to Mariners issued weekly by the Hydrographic Office, which particularly affect the charts and sailing directions, should be considered first. These notices consist of a collection of statements pertaining to safe navigation, made up in pamphlet form, which are issued weekly by the Hydrographic Office. The statements are notices themselves pertaining to every matter which is of importance to the seaman and navigator. When a new rock, shoal, or other danger is discovered and reported to the Hydrographic Office, the information is immediately published, the source and its nature being clearly set forth. The same is true of the installation of new lights, changes in lights, alterations or changes in buoyage and other day marks in any part of the world, wrecks, and all subjects a knowledge of which would tend to lessen the dangers of navigation. These notices are issued in a convenient form for cutting out. They are distributed from the Hydrographic Office and from its numerous branch offices to all vessels of the Navy and to not less than 3,000 merchant vessels, officers of which at the present time are collecting information for the Hydrographic Office. When received, the immediate duty of the navigator or master is to enter the corrections by hand on the charts affected (these charts being designated in the notices), and, in addition, to cut out each notice and place it in its proper place in the Sailing Directions. You will be surprised to learn that notices affecting navigation issued by the Hydrographic Office now amount to about fifty a week, or over 2,500 a year. This does not seem so strange, however, when we take into consideration the amount of coöperation which the Hydrographic Office receives in this most important aid to mariners. Cordial coöperation is afforded by the United States Engineers, the U. S. Coast and Geodetic Survey, the U. S. Lighthouse Service, the U. S. Weather Bureau, the U. S. Life-saving Service, Fish Commission, United States Consuls, hydrographic offices of foreign governments, foreign astronomical and meteorological observatories, our own naval vessels, and something like 3,000 ships of various nations, in which are included men-of-war of some of those nations as well. Reports to this office come in as many as fourteen different languages.

In this day of high speed on the ocean you can readily understand the anxiety which the great shipping firms have in regard to the safety of their vessels, a feeling which actuates them as well as their governments to hesitate at no expense to obtain such information as is contained in these notices. It is not uncommon for the Hydrographic Office to get cablegrams from abroad giving information of serious dangers to navigation.

A glance through one of these pamphlets would give an inkling of the dangers to which those who go to sea are subject. A fair part of these notices come through the branch hydrographic offices, which are located in sixteen of our principal ports.

BRANCH HYDROGRAPHIC OFFICES

These branch offices, which are in charge of naval officers, with nautical experts as assistants, are veritable bureaus of nautical information. They

receive and distribute information, visiting all incoming vessels for this purpose, and hold themselves ready to examine charts from any vessel, verifying the same or pointing out necessary corrections, examining and correcting instruments, explaining nautical subjects, and in any way possible giving aid to mariners. In many cases they have even adjusted compasses. At the present time the officers at three of them are giving night lectures on navigation to shipmasters. Many of these have been called as witnesses in admiralty cases, and in general their influence in improving the means of safe navigation has been most marked. A time-ball service is carried on at twelve of these offices, which is taken advantage of by the masters of vessels possessing chronometers, thus enabling them upon going to sea to feel sure of the error and rate of this most important navigational instrument.

These offices place within almost immediate reach of ship captains all the information contained in the main office and enable the main office to obtain, with accuracy and quickness, all important information brought by incoming vessels. They have been of great benefit to shipping firms, marine insurance companies, admiralty lawyers, and practically to all interests connected with maritime affairs.

In 1880 a commander in the British Navy examined the chart outfit of three steamers and found as follows:

On the first, 73 charts out of 93 needed renewal.

On the second, 39 charts out of 49 needed renewal.

On the third, 95 charts out of 104 needed renewal.

At the present time no vessel need leave a port in which there is a United States branch hydrographic office with incorrect charts unless the captain wishes to do so.

Other essential aids to navigation are published by the Hydrographic Office, but space will not permit of a detailed description. Amongst the most important can be mentioned the American Practical Navigator, a book on navigation which no navigator should be without. This is revised frequently and the call for it is continuous. Frequent issues of the Lists of Lights of the World are necessary, the changes in lights all over the world being frequent and often very radical. Azimuth tables for the use of the navigator in determining his compass error have been issued by this office for the last twenty-odd years. The International Code of Signals, which by law all mariners are compelled to have, is an issue of this office. Publications on great-circle sailing; means of searching for isolated submarine peaks; on the variation of the compass; sunrise and sunset tables; illustrated cloud forms; matters pertaining to marine meteorology and to terrestrial magnetism are amongst the practically useful issues of this office, and all are prepared by its attachés. I can safely state that the great majority of deep-sea vessels now afloat possess some practical aid to navigation published by the U. S. Hydrographic Office.

PILOT CHARTS

The Pilot Charts of the North Atlantic and North Pacific, the permanent issue of which was inaugurated by the Hydrographic Office in 1883, are not navigational charts, strictly speaking, but are simply graphic illustrations of the conditions of winds, currents, wrecks, derelicts, icebergs, fogs, etc., which may reasonably be expected during the month for which the chart is issued. The primary credit for this practical aid to navigation is due to Lieutenant Maury. When, in the early forties, he started his system of collecting information in regard to winds, currents, and other matters pertaining to the ocean, it was with a view of eventually being

able to predict to the mariner, with a reasonable degree of probability, all necessary meteorological data for any period of the year.

For convenience, we will only consider the Pilot Chart of the North Atlantic, the principal references to which will also apply to the chart for the North Pacific.

A short résumé of the manner in which information is collected for this chart, followed by a general description of the subject-matter, will give the best idea of its use and value. The data collected by Maury from 1844 to 1861 were, generally speaking, taken from the log books of vessels for individual 5° squares on the world's water surface, and in the majority of cases gave information for each hour of the day in whatever part of the world any observing vessel happened to be.

About twenty years ago it was deemed advisable to alter this system of collecting information, and the observers of the office were furnished with a blank observation book, in which the data required were to be taken by all observers only once a day and at the same instant of time—Greenwich mean noon. The observations thus recorded give the direction and force of the winds the reading of the barometer and thermometers, the temperature of the water, the character and percentage of cloud, visible, and the character of the sea. Immediately upon the arrival in port of a vessel taking such observations, these weather reports are sent either by mail or through the United States consul to the Hydrographic Office, where the information mentioned above is plotted on a synoptic chart. This chart is divided into squares of 5 degrees of latitude and 5 degrees of longitude, and each element of information previously mentioned, except clouds and the state of the sea, is indicated in its respective square by a particular symbol. Through inability to get the information quickly (as very frequently the record of a sailing vessel does not get to the Hydrographic Office until a long time after the observations were taken), it requires many months before all the records for any one year for each individual square can be collected and plotted. A separate synoptic chart is used for each day in the year. Eventually each element is averaged for each month of each year during which the observations have been taken, and a mean of each month of all the years is transferred to the pilot charts proper.

EXPLANATION OF NORTH ATLANTIC PILOT CHART FOR FEBRUARY, 1903

All the possibilities and recommendations for the coming month relating to winds, calms, fog, gales, weather forecast, barometric and thermometric data, and steamer and sailing-vessel routes are noted in blue. All matter noted in red relates to what has actually occurred in the past, and is variable in character and not possible of prediction with any degree of certainty. For instance, the red lines, of which there are so many on the accompanying chart,* represent the paths of the centers of storms which have actually occurred during the last five years. Derelicts and wrecks, drifting buoys, icebergs, and field ice which have been actually seen and reported during the preceding month are noted in red, the positions indicating to the mariner the region in which they are likely to be found.

This chart thus becomes a continuous warning to seamen for the month on the first day of which it is issued, and is of practical economic benefit, in that it operates to shorten ocean travel and to lessen dangers to life and property. The information given is considered so important that the agents of many of our great transatlantic liners telegraph

*The chart is issued as a Supplement to this number of the NATIONAL GEOGRAPHIC MAGAZINE.

the positions of wrecks, derelicts, and ice to their home offices as soon as they are informed thereof by the Hydrographic Office or by its branch offices along our Atlantic seaboard.

In order to still further aid navigators by giving timely notice of new dangers reported, it has been found necessary to supplement the Pilot Charts by the Hydrographic Bulletin, which is issued weekly and gives the latest information of wrecks, derelicts, ice, and other dangers to navigation.

It has been found advisable, in fact necessary, to have articles from time to time on the Pilot Chart treating of some essential for the navigator in the management of his vessel. Thus, during each of the cyclone months in the North Atlantic, an illustrated article is printed either on the face of the chart or, if there is not room there, on its back, explaining the nature of cyclones, the method of avoiding them, and, when caught in them, proper directions for managing a vessel. Articles on the use of oil at sea, which have been the means of saving valuable ships and of rescuing the crews of wrecked vessels; on the use of instruments necessary in navigation; on the features which cause disturbances of the compass, and on various methods for obtaining the positions of vessels at sea and for plotting the positions near a coast, are issued whenever space and time permit.

Until within the past year this Pilot Chart was unique in being the only thing of the kind published in the world; but its importance to maritime interests had been so thoroughly proved and the necessity for immediate notice of all dangers, particularly on frequently traveled routes, had become so evident that two other nations—England, the oldest sea power, and Germany, the youngest—took up the matter and are now issuing similar publications.

I know of no government publication of more interest to those who go to sea than this, and feel sure that you will agree with me after a short résumé of what it actually does for the mariner. Let us consider the chart for the month of February, 1903.

In the upper left-hand corner of the accompanying Pilot chart is a fog inset chart, which is divided into 1° squares, each one of which contains a number which indicates the percentage of days of each month—*i. e.*, the number of days in each one hundred—in which the weather may reasonably be expected to be foggy, these percentages being the result of thousands of observations for years back. They are only probabilities, but they are good probabilities, and the sailor makes use of them. But a short time ago the captain of the flagship *Brooklyn* told me that when conveying the remains of the late Lord Pauncefote to England last summer, the season of maximum fog frequency, he followed the fog forecast of the Pilot Chart for the month and found it reliable.

None but those in charge of vessels can understand what a fog at sea means. The sense is the nearest approach to that of blindness that I can imagine. One can see for some distance at night; but in a thick fog such as what is known as the blue fog of our northern waters—a fog which is said by old salts to be as thick as mud—the sense of sight fails and that of hearing is brought into intense play. But even the latter sense fails under certain circumstances, such as on a high-speed steamer, where the noise of the engines and the swash of the vessel's hull through the water shut off all but unusually loud sounds. In a late admiralty collision case—the cutting down of a sailing vessel by a steamer—the evidence showed that while the people on the sailing vessel had heard the steamer's whistle for 20 minutes before the collision, the officers of the steamer had at no time heard the fog-horn of the sailing vessel.

The same of the sub-chart of gales,

which is below that of fog, in which percentages for a force of 8 and over of the Beaufort's scale—from 40 to 100 miles an hour—are given in 5° squares. No vessel other than a regular high-powered liner, unless absolute necessity demands, takes a route in which such gales are frequent, on account of the danger to life and property, the wear on the vessel, and the consequent delay. This sub-chart tells them the only things they want to know—how to avoid the stormy area and what route to choose.

The best routes for low-powered steamers, from the English Channel to the Gulf and from Gibraltar to New York, are also shown. The latter, for instance, is longer in distance than a direct route. Experience has shown, however, that by reason of encountering more favorable winds, seas, and currents, it is shorter in time, with much less wear and tear on the vessel and crew.

Down in the lower left-hand corner are some red symbols to designate icebergs and field ice. No bergs or field ice were reported during January, so none are indicated on the accompanying chart. On the pilot charts of the summer months, however, the region above and about the Grand Banks is dotted with these little red symbols. If we were issuing a pilot chart of the south Atlantic Ocean for this month, these ice symbols would be very numerous in its southern portion.

You may remember that it was not many years ago that we had frequent reports of vessels colliding with icebergs; but such is now very much less the case, principally due, I feel that I can say with absolute truthfulness, to the efforts of the Hydrographic Office, as a result of which the transatlantic lines were, some years ago, induced to adopt regular lanes of transit to and from England and the United States—lanes which take them over a safer route, in that it is practically clear of ice.

Over on the right-hand side of the pilot chart is a sub-chart of isobars and isotherms for the month of February, showing the average heights of barometer and temperature to be expected, and indicating, by reference to the areas of low and high barometer, what movement of the atmosphere may generally be looked for. The intelligent mariner knows that any marked deviation from these normal values denotes a change in weather.

Above this sub-chart will be found a forecast—not a prediction—of the weather, the average of thousands of observations taken during the past fifteen years.

The main or sea part of the chart is divided up into 5° squares, in the center of each one of which will be found a small circle from which radiate arrows, each one pointing towards the center. These arrows indicate the direction in which winds may be expected to blow, the number of feathers indicating the force by Beaufort's scale. Take the example noted in blue under the heading of "Prevailing Winds and Calms," at the bottom of the chart on the left side. The arrows fly with the wind, and the number of hours in each one hundred during which the wind may be expected to blow from that direction is found by transferring the length of the arrow to the scale below, the number of feathers indicating the force. Thus, in this example, we will in each one hundred hours expect to find a northeast wind with a force of 3 for 18 hours; an east wind, force of 3 for 10 hours; a southeast wind, force of 4 for 24 hours; a south-southeast wind, force of 3 for 25 hours, and a southwest wind, force of 3 for 10 hours. The figure 13 within the central circle indicates 13 hours of calms, light airs, and variable winds.

The small black arrows point out the average set of currents, whether regular or drift.

The long red lines on the face of the chart represent paths of the centers of well-determined storms which have occurred in previous years during the month of February. Tropical cyclones do not occur on the north Atlantic during this month, but storms of great violence are frequent. From an examination it is plainly evident that an average storm track for the month would be of no practical value; but these of previous years are most useful as, if from indications of weather, sea, and barometer, the seaman finds himself on or near the track of one of these, he has good reason to suppose that he will experience a similar one.

DERELICTS

Notice the symbols for derelicts and wrecks at the lower left-hand corner and observe the large number of these obstructions on the body of the chart. These, with icebergs and fogs, and particularly a combination of all three, give the mariner the greatest anxiety. Each one of these constitutes a menace to life and property, most dangerous because not plotted on any other chart nor marked in any manner. Those symbols on the chart which are bottom up give warning of especially dangerous derelicts, the kind that show so little surface above water as not to be seen, even in daylight, until close at hand. We read too often of vessels which have put to sea and never been heard of afterward, and we can easily imagine that some of them have been lost through collision with these floating dangers. A collision with an abandoned vessel laden with either coal, iron ore, or steel rails would materially damage any vessel afloat.

Only a few years ago a large Dutch transatlantic liner struck a submerged wreck which broke her propeller and probably stove a hole in her bottom. The steamer was abandoned in a sinking condition, but fortunately not before another steamer had come along and rescued the passengers and crew.

During one interval of seven years the total number of derelicts reported amounted to 1,628, of which 482 had been identified by name. This means an average of 19 per month—that is, it is reasonable to believe that there are never less than 19 of these floating dangers in the north Atlantic all the time, and the records of the Hydrographic Office show that the average time a derelict remains afloat is about thirty days. The identified ones are easily followed and their tracks plotted on the pilot chart from month to month. A few remarkable instances of ocean drift may be interesting.

A three-masted schooner, *The Fannie E. Wolston*, was abandoned on October 15, 1891, and frequently seen after that for 1,101 days—three years and six days—at the end of which time, after traveling about 9,000 miles, she was lost sight of.

Take the case of the lumber-laden schooner *W. L. White*. She was abandoned waterlogged about 80 miles off the capes of the Delaware during the great blizzard of March, 1888. She drifted 5,910 miles, following the Gulf Stream a good way across the Atlantic, and about eleven months later stranded on one of the Hebrides, having been sighted and reported forty-five times during the interval. For over six months of this time she was a constant menace to our transatlantic commerce.

And another interesting case is that of the ship *Fred B. Taylor*, which was cut in two by a steamer, the two parts remaining afloat. Strange to say, these parts separated, the stern drifting to the northward and going ashore on the Maine coast forty-six days later, and the bow drifting to the southward and being lost sight of off the Maryland coast seventy-two days later.

From September, 1889, up to the

present time the Hydrographic Office has received reports of 127 collisions with ice, derelicts, and wreckage in the north Atlantic alone, and others probably occurred which were never heard of.

The Navy Department exercises an espionage over all wrecks and derelicts on our Atlantic seaboard which are outside of the three-mile limit, and when deemed necessary sends vessels out to destroy them or tow them in. During the past year 38 dangerous obstructions were hunted for on our coast by vessels of the Navy, of which number 15 were located and destroyed. It is to be regretted that no international legislation provides for the destruction of such dangers in the broad ocean.

This pilot chart keeps our Weather Bureau's storm signals before the mariner, tells him where to find our branch hydrographic offices, and gives him no excuse for not knowing what charts are published, canceled, or extensively corrected.

THE VALUE OF THE PILOT CHARTS TO SHIPPERS

I think you will now admit that, as far as our government is concerned, the mariner is fairly well looked out for. Our Weather Bureau watches over him while in our home ports, and the Hydrographic Office does all possible to guide and guard him while at sea.

Many complimentary communications on the work of this office have been received from outside our own country, one of which I feel justified in reading to you, as it is from the highest maritime authority in the world — the British Lloyd's:

LLOYD'S, *18th July, 1902.*

SIR: I am instructed to express to you the best thanks of the Committee of Lloyd's for the Pilot Chart of the North Pacific, which is forwarded to this office periodically by your instructions. This chart is believed to be of great value to mariners navigating the waters of the North Pacific, and I am directed to inquire whether there is any intention on the part of the Hydrographic Bureau to have a similar chart constructed for the South Pacific.*

I am, sir, your obedient servant,

JAS. M. HOZIER,
Secretary.

The Chief of the Hydrographic Bureau, Washington.

Last month's Nautical Magazine contained a copy of a speech in the House of Lords by Lord Ellenborough, urging the printing of tables by which the centering error of a sextant could be determined at any time. In concluding this speech Lord Ellenborough quoted an extract from a letter from the late Captain Lecky, whose publication "Wrinkles in Navigation" made him famous. The quotation was as follows:

"I certainly think the Nautical Almanac ought to undertake the star distances; but you will probably find the United States Hydrographic Office will do it. They have no hesitation in undertaking anything they think worth doing, whereas our people take a few years to think about it."

Having thus sketched the work of the Hydrographic Office, it becomes my pleasure to say that the results achieved by this office are due to the intelligent, zealous, systematic, and painstaking efforts of as competent an office force as can be found in any similar office in any country. Some are graduates of the Naval Academy, and these, with many others, are practically devoting their lives to this good work.

In conclusion, I hope that I have made it clear that the mission of the Hydrographic Office is to provide for the safe navigation of American ship-

* The Hydrographic Office is considering the plan of publishing Pilot Charts of both the South Pacific and South Atlantic Oceans. It is hoped that in the near future it may be feasible to publish these additional Pilot Charts. Editor.

ping in all foreign waters by obtaining and disseminating necessary information on all nautical subjects, a knowledge of which tends to reduce the dangers of navigation to a minimum. This also means that its work is a practical preparation for war, inasmuch as the results form a safeguard for our Navy the importance of which cannot be overestimated.

There can be no question as to the necessity for this work when we consider that even now, with our far-reaching distribution of aids to navigation, no less than 5,000 lives, on an average, are lost at sea each year.

WHY GREAT SALT LAKE HAS FALLEN

By L. H. Murdoch

Section Director, U. S. Weather Bureau

THE rapid decline in the water level of Great Salt Lake during the past few years has caused the people of northern Utah, and more especially those of Salt Lake City, to feel considerable apprehension lest this remarkable body of water will soon be a thing of the past. The reading of the gage at Garfield Beach on December 1, 1902, was 3 feet 5 inches below the zero of the scale, showing a fall of 11 feet 7 inches since the close of 1886, the year in which the last rise terminated, and a level between three and four feet below that of 1847.

The water level of a closed lake may be affected by a change in the general inclination of its basin, and will fall as the result of increased temperature, decreased relative humidity, shortage in precipitation, or increased evaporation as a result of spreading the water from inflowing streams over the soil for irrigation or any other purpose.

The present fall in the lake is evidently due to a combination of shortage in precipitation and the loss of water through irrigation, but the shortage in precipitation is undoubtedly the predominating factor.

The present area of the lake is about 1,750 square miles, and its drainage basin is about twenty times that area. The normal annual precipitation for the entire drainage basin is about 14 inches, and the annual evaporation from the surface of the lake is about 5 feet. The report of the Twelfth Census shows that in 1899 the amount of land irrigated in the basin of the lake was 609 square miles, which is a trifle more than double that under irrigation in 1889.

Flynn's table giving the duty of water in irrigating shows that for Utah the duty is 2.38 acre inches for 10 days, which is 23.80 acre inches for 100 days, or the irrigation season. The writer is not aware that any experiments have been made in northern Utah to determine the loss of irrigation water by evaporation and percolation. The soil in the drainage basin of the Great Salt Lake is generally a sandy loam, which would favor quite rapid percolation, but not very rapid evaporation. Judging from the results obtained in other states, and making due allowance for the low relative humidity of this region, it is believed that 12 inches for evaporation and the growing plant is an ample allowance. This would leave 11.80 inches to be returned to the lake or its tributaries by subterranean courses.

The present area of the lake is nearly

three times that of the land under irrigation. With precipitation at normal, the loss of 12 acre inches of water by means of irrigation should therefore produce the first year a fall of four inches in the lake level, and a decreasing fall every year thereafter until a balance would be reached between the area of the lake and the amount of water it received, when no further fall would occur as a result of irrigation.

The problem is necessarily a very intricate one, and at best only general results can be obtained from the most careful calculations. The writer, however, feels confident that irrigation cannot be charged with more than three or four feet of the last decline in the lake level. It should be borne in mind that irrigation began in 1848, and was in operation during the years the lake rose rapidly and maintained a high level.

The precipitation data for Salt Lake City, including that for Ft. Douglas, are complete back to 1863, with the exception of 1866, and that has been approximated at 22.25 inches. The average precipitation for this locality, using all the data up to the close of 1901, is 16.65 inches.

From 1865 to 1886 a wet cycle prevailed, and during that time the average annual precipitation was 18.42 inches, or 1.77 inches above the normal. From 1887 to 1902 a dry cycle has prevailed, the average precipitation during this period, estimating the precipitation for December of 1902 at normal, being 14.80 inches, or 1.85 inches below normal.

During the wet cycle the lake rose rapidly from about 3 feet in 1864 to about 13 feet in 1868. A decline then followed, but the reading was nearly 13 feet again in 1876. The last rise terminated in 1886, when the level of 9 feet 2 inches was reached. Since 1887 there has been a steady decline in the level, the total fall from the close of 1886 to the close of 1902 being nearly 12 feet.

With the annual precipitation reduced to 14.80 inches at Salt Lake City, the lake would not fall without limit, but after a number of years, as in the case of the loss resulting from irrigation, a balance would be reached between the area of the lake and its inflow and the decline would thereupon terminate.

The fall in lake level has been much more rapid during the past three years than for any like period during the preceding years of drouth. This is mainly due to the fact that the deficiency in precipitation has been greater during this period than during any similar period of the present dry cycle. The precipitation record at Salt Lake City for 1901 does not fairly represent conditions for the entire basin. From May 2 to 4 4.08 inches of rain fell there, but the excessive rainfall covered only Salt Lake, Davis, and small portions of adjoining counties, about one-twentieth of the basin, while the rainfall for other portions was comparatively light. The rise in the lake during the two weeks ended May 15 was only 1 inch, no more than would be expected though no precipitation had occurred. If the precipitation at Salt Lake City for 1901 were to be approximated from that of the rest of the basin, it would have to be placed at about 13 inches. This would make the deficiency for the last three years alone over 13 inches.

The lake is not alone in showing the effects of the drouth. Streams, springs, and artesian wells are drying up, and those which continue active are discharging much less water than a few years ago.

While it is difficult to demonstrate mathematically just how much fall in the lake level is due to irrigation and how much to a shortage in precipitation, it seems to the writer that the large deficiency of 29.60 inches in precipitation during the past sixteen years, as shown by the Salt Lake City records, must be far more of a factor than any

possible loss of water resulting from irrigating 609 square miles of land.

Drier weather than that which has prevailed during the past sixteen years has never been known in Utah, and this is a pretty good indication that the precipitation for the next sixteen years will not average less than for the past sixteen.

Even with precipitation continuing at about 15 inches, no further fall in the lake will occur, and if the annual precipitation is as much as 15 inches for the next three years, a slight rise may be expected.

Excessive precipitation is not drawn upon for irrigation, and its loss from evaporation is much less in proportion than that of normal or deficient precipitation. The result is that when excessive precipitation occurs the lake receives nearly all of the excess, and therefore rises rapidly.

The question naturally arises, How long will the present dry cycle continue? In an article entitled "Precipitation Cycles," recently published, the writer has pretty conclusively shown that weather about as dry as that in progress prevailed in Utah from about 1827 to 1864, a period of thirty-seven years. While it is known that a cycle of dry weather is followed by a number of years of excessive precipitation, and this in turn by another dry cycle, it is not believed that these recurring periods are of equal length. The past in this regard, with our present knowledge and accumulation of data, is therefore no index to the future. A wet cycle like that which began in 1865 may begin next year, or it may not begin for fifty or more years. When it does occur the lake will respond rapidly and reach levels nearly as high as those recorded in the sixties and seventies.

GEOGRAPHIC NOTES

AMERICAN CLAIMS IN THE ANTARCTIC

DURING the first half of the nineteenth century numerous American seamen explored portions of the South Polar regions and made many and important discoveries there. They named a number of places, and in several instances the lands they discovered were called after them. With the present reawakened interest in the Antarctic, it is imperatively necessary that American geographers should see to it that American Antarctic discoverers receive due recognition for their discoveries, and that American names should not be crowded off Antarctic charts. It is a pleasure to state that the British Admiralty, in its official charts Nos. 1238 and 1240, shows a desire to be perfectly fair to American explorers, a statement which unfortunately cannot be made of the authors of many semi-official or private English charts. For instance, on the charts in "The Antarctic Manual" of 1901, of all of Wilkes' discoveries only "Knox Land" is marked, and all other American names, including that of Wilkes, are omitted.

In East Antarctica the name "Wilkes Land," and also the names given by Wilkes, "Ringgold Knoll, Eld Peak, Reynolds Peak, Cape Hudson, Point Case, Point Alden, Piner Bay, Cape Carr, North Land, Totten Land, Budd Land, Knox Land," should certainly be marked on all atlases. In West Antarctica there are two American names which require prominent places, "Palmer Land and Pendleton Bay." Nathaniel B. Palmer was probably the discoverer, and certainly the first explorer of the north coast of West Antarctica,

and Benjamin Pendleton, before 1828, discovered a great bay or strait on the coast which, not before 1832, received the name of Graham Land.

It would be a great help in obtaining justice for American explorers if an official chart of the Antarctic could be prepared by the United States Hydrographic Office, so as to place officially before the world American claims in the Antarctic, and the National Geographic Society could do no more important work in the next few years than to insist that proper recognition be given to distinguished American Antarctic explorers, and that their names be commemorated by remaining attached to their discoveries.

EDWIN SWIFT BALCH.

RECLAMATION OF ARID LAND IN CALIFORNIA

THE greatest opportunity for the reclamation of arid lands in California, and perhaps in the entire Southwest, has been found to lie in the utilization of the waters of the Colorado River on its adjacent lands in California and southern Arizona. As a result of an investigation along this river, made by the hydrographic branch of the United States Geological Survey, the extent of the alluvial bottom land between Camp Mohave and Yuma was found to be from 400,000 to 500,000 acres. Extended surveys were begun November 1, 1902, to determine the area and quality of these bottom lands, the possibility of diverting water to them, and the probable expense of their reclamation. To this end a hydrographic survey of the region was begun, including the gaging of the river, the location of canal lines, soil analysis, and the determination of silt and evaporation; and a topographic map of the lands upon which distribution systems may be considered was made. This map, on which the topographic features are clearly and accurately shown, will be of great value in assisting engineers to locate the main canal lines, and is essential to a comprehensive knowledge of the river as a whole. About one hundred men are engaged in these investigations for the United States Geological Survey, Mr E. T. Perkins being in charge of the engineering field work, Mr E. C. Barnard in charge of the topographic mapping, and Mr J. B. Lippincott, resident hydrographer for California, consulting engineer on investigations.

The demands for irrigation in the Colorado Valley are urgent. The average rainfall at Camp Mohave is only 5.99 inches per annum, and at Yuma it is 3.06 inches per annum, while the temperatures are such as to provide twelve growing months in the year. The Colorado River derives its principal source of water supply from the melting snow on the high mountains of Utah, Colorado, and Wyoming. It reaches the stage of maximum flow, approximately 50,000 cubic feet per second, in the months of May and June, when the demand for irrigation is normally the highest; its minimum flow, about 4,000 cubic feet per second, occurs in the months of January and February, at the time of least demand. The opportunities for storage on this stream are very great.

The silts of the river are difficult to handle in canals; but the fertilizing properties which they have are such that lands irrigated with these muddy waters will never require further fertilization.

Mr R. H. Forbes, of the Agricultural Experiment Station at Tucson, Ariz., who has made a study of the silt in the Colorado River, has pointed out that this stream resembles the Nile in many particulars. Like the great river of Egypt, the Colorado is subject to an annual summer rise sufficient to overflow the extensive areas of its borders and delta lands. These high waters are rich in fertilizing sediments, are exceptionally free from alkaline salts, and come

at an opportune time for irrigation. Mr Forbes maintains that when the Colorado is understood and utilized as successfully as the greater and better-known Egyptian stream, it will be recognized as the American Nile—the creator of a new country for the irrigator, the mother of an occidental Egypt.

ALASKAN BOUNDARY DISPUTE

BY the terms of a treaty signed January 24 by Secretary Hay and the British Ambassador, the Alaskan boundary dispute is to be referred to a special commission or tribunal consisting of three jurists from the United States and three from Canada. The vote of four members of the commission will be a binding decision. This is the plan originally proposed by the American members of the Joint High Commission, but which was rejected at that time by the British Commissioners. The Senate will doubtless ratify the treaty, so that this vexing question of the interpretation of the treaty of 1825, raised by Great Britain for the first time in 1898 after the American interpretation had been accepted for 73 years without a protest or complaint, will soon be settled. In this connection attention should be again directed to the masterly discussion of the dispute by Hon. John W. Foster, ex-Secretary of State and of the Joint High Commission, in the November, 1899, number of the NATIONAL GEOGRAPHIC MAGAZINE.

RECENT MAPS AND PUBLICATIONS BY THE U. S. GEOLOGICAL SURVEY

THE latest and most complete representation of the physical features of southern Indiana are found in a series of topographic map sheets issued by the Survey and known as the Degonia Springs, Boonville, and Belton sheets—each sheet being named from a prominent place appearing on it—and covering portions of Warwick, Spencer, Dubois, Pike, Gibson, and Vanderburg counties.

As a part of its investigation of the coal-producing regions of the country, the Survey has also issued, as Geologic Folio No. 84, a series of maps covering the larger portion of the coal region included in the First Congressional District of Indiana. The quadrangular area covered embraces nearly 1,000 square miles, and includes parts of Pike, Vanderburg, Warrick, Spencer, and Dubois counties.

The Survey, in coöperation with the State of Maine, has recently issued a new map of the region surrounding the entrance to the Penobscot River, known as the Castine quadrangle. The map differs from the charts issued by the Coast and Geodetic Survey in giving the details of features on the islands and the mainland, whereas the latter maps are confined almost exclusively to the marine features of the region—soundings, channels, and the outlines of the coast.

A topographic map of the region embracing Ticonderoga, in New York and Vermont, has been issued by the Survey. It is the result of a survey made in coöperation with the State of New York.

A map of East Liverpool and Wellsville, Ohio, and vicinity will be issued at an early date. The surveys were in charge of Van H. Manning, topographer, who completed the mapping of an area comprising 225 square miles along the Ohio River, which will include portions of Ohio, West Virginia, and Pennsylvania.

A detailed topographic map has been issued of a portion of the San Bernardina Valley, California, noted as one of the most highly developed irrigation districts in the country.

A reprint has been made of the map covering the famous Franklin Furnace Mining region in New Jersey.

Recent publications by the Survey include:

"Development and application of Water near San Bernardino, Colton, and Riverside, California," by J. B. Lippincott, resident hydrographer for the State of California. Mr Lippincott presents some striking instances of what may be done by irrigation. On land that fifteen years ago was worth barely 75 cents an acre as a sheep pasture now flourish, as a result of irrigation, orchards of orange and citrous trees yielding a net revenue of $100 an acre.

"Sewage Pollution in the Streams Adjacent to New York City," by Marshall O. Leighton; a discussion of the incalculable damage to property along the Passaic River of New Jersey, and along the streams flowing into the upper Hudson by discharge of city sewage.

"The Possibilities of Increasing the Water Supply of Central Washington," by F. C. Calkins, of the hydrographic division of the Survey.

"Geology of the Globe Copper District, Arizona," by Dr Frederick L. Ransome.

TIMBER LINES

AN interesting paper on "Timber Lines" was presented by Prof. Israel C. Russell to the recent meeting in Washington, D. C., of the Gelogical Society of America. The following is an abstract of the address:

"'Timber line,' as commonly defined, is the upper limit of arboreal vegetation on mountains. Its position is determined mainly by the occurrence of a mean annual temperature of about 32 degrees Fahrenheit, but locally its elevation is regulated by soil conditions and by differences between various localities in snow-fall, severity of winter storms, exposure to the sun, etc. It may with propriety be termed the 'cold timber-line.' Above it on high mountains there is commonly a region occupied by alpine flowers, and still higher a region of perpetual snow. When traced from warm to colder regions or, in general, from the equator toward either pole, it becomes lower and lower. In North America it descends nearly to sea-level in Alaska and northern Canada, where it defines the northern limit of the subarctic forest and becomes the 'continental timber-line,' to the north of which lie the barren grounds and tundras, which correspond to the zone of alpine flowers on lofty mountains in temperate latitudes.

"On some of the mountain ranges of the arid portion of the United States there is a lower limit of tree growth, the position of which is determined in the main by insufficient moisture, and locally by soil conditions, including the presence of alkali, hot winds, forest fires, exposure to the sun, etc. This may be termed the 'dry timber-line'. Below it are treeless, grass-covered plains and valleys. On the mountains of central Idaho, the cold timber-line is sharply drawn at an elevation of about 10,000 feet, while the dry timber-line, equally well defined, has an elevation of about 7,000 feet; between the two there is a belt of forest trees which encircles the mountains. In southeastern Oregon, Nevada, southern California, etc., where the climate is excessively arid, the dry timber-line is higher than in Idaho, and in certain localities meets the cold timber-line, and the mountains are bare of trees from base to summit. The dry timber-line decreases in elevation when traced from arid to humid regions. In the central part of the continental basin of North America, it defines the border of the treeless portion of the Great Plateaus and the prairie plains, and at the north coincides with the southern limit of the subarctic forest. On the borders of the treeless plateaus and the prairie plains the position of the margin of the encircling forest is determined mainly by lack of moisture, but is varied locally by soil conditions, hot winds, forest fires, etc.,

in the same manner that the lower limit of tree growth on the mountains of arid region is regulated.

"When the humidity is sufficient for the growth of trees, as for example on the mountains of New England, the dry timber-line disappears. An arid region may be bordered at a lower elevation by a region with sufficient humidity to permit trees to grow, and may then be bordered both above and below by the dry timber-line, as is the case in southern Idaho. Where an arid region reaches sea-level, as in Arizona, southern California, and the west coast of Mexico, etc , there is no forest below the arid belt, and in certain localities the dry timber-line meets the cold timber-line, and the mountains are bare of trees from sea-level to their summits.

"There is also a third general cause which draws a limit to timber growth, namely, excessive humidity, as for example on the borders of swamps, the margins of lakes, etc., which may perhaps be termed the 'wet timber line.'"

RECLAMATION OF THE HIGH PLAINS

THE efforts of the hydrographic branch of the United States Geological Survey are being directed to the discovery of sufficient water to lead to the reclamation and habitation of that area of the Great Plains lying west of the prairies and east of the Rocky Mountains, commonly known as the High Plains. The section is admirably suited to agriculture and grazing except for its inadequate water supply, which is so uncertain that great areas of fertile land lie quite uninhabited.

This is especially true of the regions lying between the river valleys which cross it at wide intervals. These broad intervalley plateaus are practically waterless, but it has been discovered that water may be had from underground sources by wells and windmills, and it has been demonstrated that, while the region may not be largely reclaimable by irrigation, it may be successfully used for grazing by creating stock-watering points at comparatively close intervals. It will, however, be difficult, if not impossible, for the grazers to raise anything besides fodder cane of the drought-resisting varieties, such as Kaffir corn. Vegetables and other products will, for the most part, probably have to be grown elsewhere.

The river valleys, on the other hand, seem destined to be extensively cultivated by irrigation, the water for which will be pumped from the gravels of the river beds, where an underflow has been known to continue in the summer season after the rivers themselves have ceased to run. These areas will furnish garden produce for the ranches on the plateau, and in this manner make the region as a whole habitable. The details of this investigation, with exhaustive studies of the nature of the underground waters of the High Plains, appear in the Twenty-first and Twenty-second Annual Reports of the United States Geological Survey, the latter of which is now in press and will soon be issued.

Commander Robert E. Peary, at a recent meeting of the Geographical Society of Philadelphia, declared that he was willing to lead another expedition in search of the North Pole if some wealthy Arctic enthusiast was ready to put up $150,000 to finance the expedition. Mr Peary believes that by making Cape Hekla the base, as outlined in the last number of this Magazine, the Pole could be reached, but it would take two years to do it.

The U. S. Coast and Geodetic Survey Steamer Blake, commanded by Capt. R. L. Faris, arrived at San Juan, Porto Rico, January 27, and reports a successful series of daily magnetic observations aboard ship on the passage between the

Capes of the Chesapeake and San Juan, Porto Rico. These observations were made under the direction of Prof. L. A. Bauer, Chief of the Magnetic Division of the U. S. Coast and Geodetic Survey.

Mr William Ziegler authorizes this Magazine to announce that he intends to send forth another north polar expedition this summer. The party will go north on the *America*. The personnel of the expedition is not yet complete so that a list of the members cannot now be given.

Two maps of Guatemala, each on the scale of 12.5 miles to one inch, have recently been published by the Bureau of American Republics. In addition to names of towns, volcanoes, railways, telegraph stations, etc., one map shows the approximate location of minerals in Guatemala, and the other the general elevation and the agricultural features of the country.

The Carnegie Institution has made a grant of $5,000 for the purposes of exploration; also a grant of $12,000 for geologic exploration.

The report of the Brown-Howard Expedition to Labrador in 1900, by Prof. E. B. Delabarre, has been published by the Geographical Society of Philadelphia. It forms a handsome volume of 212 pages.

NOTICE

PERSONS who have copies of the following numbers of the NATIONAL GEOGRAPHIC MAGAZINE and who are willing to sell them will confer a favor by writing to the National Geographic Society:

Vol. I, nos. 2 and 4 and index.
Vol. II, no. 2.
Vol. IV, nos. 1, 2, 3, 4, 5, 6, 7.
Vol. X, no. 6 and index.
Vol. XIII, no. 1.

DECISIONS OF THE U. S. BOARD ON GEOGRAPHIC NAMES

December 3, 1902

Arabella; island (Canadian) in the St Lawrence River, near Clayton, Jefferson County, New York (not Ambella nor Amelia).

Behestian; township, Ouachita County, Arkansas (not Behrstian).

Brakel; creek, Chenango and Cortland Counties, New York (not Brackel nor Braket).

Canadarago; lake, Otsego County, New York (not Schuyler).

Cape Rosier; post-office, Hancock County, Maine (not Cape Rozier).

Catatonk; creek, post-office, and railroad station, Tioga County, New York (not Catatunk).

Channahatchee; creek, Elmore County, Alabama (not Cedar).

Diddell; post-office and railroad station, Dutchess County, New York (not Didell).

Freeo; bayou, Douglas and Ouachita Counties, and township, Ouachita County, Arkansas (not Frio)

Grenell; island in St Lawrence River, and post-office, Jefferson County, New York (not Grennell, Grinnell, nor Stuart).

Heart; island in St Lawrence River, Jefferson County, New York (not Hart nor Hemlock).

Ionia; post-office, railroad station, and village, Ontario County, New York (not Millers Corners).

Lake of the Isles; lake on Wellesley Island, St Lawrence River, Jefferson County, New York (not Waterloo).

Leek; island (Canadian), St Lawrence River, near Grindstone Island, Jefferson County, New York (not Leak nor Leaks).

Little Tobehanna; creek, Schuyler County, New York (not Little Tobyhanna).

Lounsberry; locality, post-office, and railroad station, Tioga County, New York (not Canfields Corners).

McGraw; post-office, railroad station, and village, Cortland County, New York (not McGrawville).

Millen; bay, St Lawrence River, Jefferson County, New York (not Mellen nor Millens).

Mud; lake, Jefferson County, New York (not Edmund nor Edmonds).

Nowadaga; creek, Herkimer County, New York (not Indian Castle nor Nouadaga).

Ocquionis; creek, Otsego and Herkimer Counties, New York (not Fish).

Osburn; post-office and railroad station, Shoshone County, Idaho (not Osborne).

Petri; post-office and railroad station, Hancook County, Kentucky (not Petrie nor Petri Station).

Philomel; creek, Jefferson County, New York (not Phileman nor Philemon).
Salubrious; point, Lake Ontario, Jefferson County, New York (not Vesuvius).
Savilton; locality and post-office, Orange County, New York (not Savil, Savill, nor Saville).
Shadow; brook, Otsego County, New York (not East Springfield).
Stanbro; village, Chenango County, New York (not Stambro).
Sterling; township, Vernon County, Wisconsin (not Stirling).
Socapatoy; creek, precinct, and village, Coosa County, Alabama (not Socapartoy, Soccopotoy, nor Sucapatova).
Terlingua; creek, post-office, and village, Brewster County, Texas (not Latis Langua, Tarlinga, Tasa Lingo, Terlinga, nor Terlingo).
Tobehanna; creek, Schuyler County, New York (not Tobyhanna nor Big Tobyhanna).
Travelers Rest; post-office and precinct, Coosa County, Alabama (not Travellers Rest).
Tygart; river, West Virginia (not Tygarts Valley nor Valley).
Vanduzer; post-office and railroad station, Ouachita County, Arkansas (not Vanduser nor Van Duzer).
Volcan; mountains, San Diego County, California (not Balcan nor Bolcan).
Wolfe; island (Canadian), St Lawrence River, near Clayton, Jefferson County, New York (not Grand nor Long).

GEOGRAPHIC LITERATURE

J. S. Diller is the author of two reports recently published by the U. S. Geological Survey—"The Geology of Crater Lake National Park" and "Topographic Development of the Klamath Mountains." The former tells the geological history of the only crater lake in the United States. The lake and surrounding country in May, 1902, was dedicated by Congress as a national park. The latter describes the development of the Klamath Mountains of California, a range which includes a number of peaks varying from 7,000 to over 9,000 feet. The reports contain some remarkably fine illustrations.

"Commercial India in 1902" is the title of a recent monograph prepared by the Treasury Bureau of Statistics. This report shows that the commerce of India in 1902 was larger than that of any preceding year in its history. India ranks sixth in the list of world's exporting nations. Its exports reached $382,000,000 in the fiscal year ending March 31, 1902.

India is one of the comparatively few countries of the world whose exports exceed imports, the exports of India in 1902 exceeding the value of its imports by $127,000,000, which is a larger excess of exports than that of any other country except the United States. The value of the imports in the fiscal year 1902 was $264,000,000, of which practically two-thirds were drawn from the United Kingdom and only 2 per cent from the United States. Of the exports, 25 per cent went to the United Kingdom and 12 per cent were sent to the United States. Of the exports, rice, hides and skins, jute, cotton, tea, opium, and oil seeds are the principal items in the order named. The principal imports are cotton manufactures, which form more than one-third of the total; metals, hardware and cutlery, sugar, oils, silk, raw and manufactured; woolen goods, and machinery of various kinds.

The U. S. Coast and Geodetic Survey has just published a List and Catalogue of all the publications of the Survey. It makes a quarto volume of 237 pages. The List is arranged chronologically and the Catalogue alphabetically, by authors, subjects, places, etc., with many cross-references.

"Paraguay" is the title of a very valuable brochure of 187 pages recently published by the Bureau of American Republics. The book contains an excellent map, some good illustrations, and many interesting facts about the country and people of the South American Republic.

NATIONAL GEOGRAPHIC SOCIETY

The proceedings of the Society during December, 1902, and January, 1903, will be published in the March number.

REGULAR MEETINGS.

February 13.—"The Work of the Census Office." Hon. William R. Merriam.

February 27.—"The Work of the Naval Observatory." Capt. Charles H. Davis.

March 13.—"The Work of the Geological Survey." Hon. Charles D. Walcott.

March 27.—"The Work of the Library of Congress." Hon. Herbert Putnam.

This is the last meeting of the season.

POPULAR LECTURES.

February 6.—"From Paris to New York Overland." Mr Harry de Windt. (Illustrated.) This is the account of a remarkable journey of 18,000 miles by land from Paris to New York via Bering Strait.

February 21.*—"Tropical Development, a Temperate Zone Problem." Hon. O. P. Austin. (Illustrated.)

March 6.—"The Geographic Distribution of Insanity in the United States." Dr W. A. White, Director of the Binghamton State Hospital, New York.

March 20.—(The last lecture of the season.) "Captain John Smith and Old Virginia." Mr W. W. Ellsworth, of the Century Company. (Illustrated.)

As Mr Paul du Chaillu has not yet returned from Russia and will probably not return for some months, contrary to his original plans, his lecture before the society on "Russia of Today" has been postponed until next winter.

THE AFTERNOON COURSE OF LECTURES. IN COLUMBIA THEATRE AT 4.20 P. M.

The general subject of the course is "The United States." During recent years our country has been advancing by leaps and bounds, until today it is the most wealthy of nations. New York is now practically the financial center of the world. American capitalists have within the last four years floated loans for Mexico, Germany, England, and Russia, and have placed hundreds of millions of dollars in investments abroad. The question now in every mind is, What elements in the United States have helped us to earn this tremendous national wealth and power and have won for us commercial supremacy in the markets of the world? To partially answer this question is the aim of the present series of five lectures. In other words, the subject of the course is "The Basis of the Wealth and Power of the United States."

Diagrams and illustrations will be used very freely, but statistics and tables will be avoided as far as possible. The lecture committee desire to have the subject treated in a popular way rather than from a statistical or technical point of view.

* Please note that this is Saturday.

1. "Lands and Waters." The first lecture in the series will treat of the unexcelled natural features of the United States—our deep, secure harbors on the Atlantic, Gulf, and Pacific seaboards, our great rivers which penetrate into the heart of the country, our vast fertile plains and lofty mountains, in which are buried untold mineral wealth, and our inland lakes, all seemingly ranged in most fortunate conjunction to mutually help each other, and the elements and routes of commerce. Lecturer, Mr Cyrus C. Adams, the noted writer and lecturer on geographical themes. February 10, 1903.

2. "The Soil and its Products." The second lecture will deal more particularly with the land and the products of the land—agriculture. Twenty billions of dollars are invested in the agricultural interests of the United States. We raise annually two billion bushels of corn and reap every year a larger crop of wheat than the combined wheat crops of Argentina and Russia.

In 1901 the United States sent nearly one billion dollars' worth of food—wheat, pork, beef, etc.—to the people of Europe. We are literally the storehouse of Europe. Lecturer, Secretary of Agriculture, Hon. James Wilson. February 18, 1903.

3. "The Industries." The third lecture will treat of the industrial wealth of the United States. The value of our manufactures exceed that of any other nation. In the manufacture of steel we lead the world, and in cotton and woolen fabrics we are eclipsed by no one. Our railways—two hundred thousand miles of them—penetrate to every corner of the country, binding the whole nation into one compact unit. Our telegraph and telephone systems enable men to communicate instantaneously though thousands of miles apart. Lecturer, Hon. O. P. Austin, Chief of Bureau of Statistics, Treasury Department. February 25, 1903.

4. "Mines and Mining." The fourth lecture will treat of the mineral wealth of the United States. During each of the last three years we have produced more coal than England; in 1902 we produced more than one-half of the refined petroleum; more than one-third of the world's production of iron ore in 1902 was obtained from the United States mines; three-fifths of the copper output for the same year came from the United States. Lecturer, Mr. Charles Kirchoff, editor of *The Iron Age*. March 4, 1903.

5. "The Men Who Make the Nation." The fifth and last lecture will treat of the people of the United States. The mingling of races and peculiar conditions have bred a distinct and original people, who mould the gifts of nature to their will. The inventive genius of the American has enabled him to increase many times the resources nature has given him. The typical American has not yet been bred, but we may prophesy what he will be and what place he will hold in the world. Lecturer, W J McGee, LL. D., Vice-President National Geographic Society. March 11, 1903.

XUM

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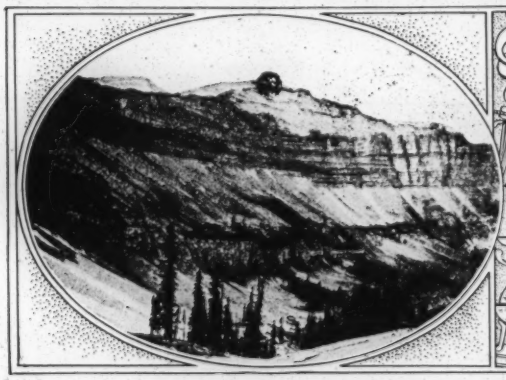

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